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IN THIS ISSUE

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CHEMICAL AGE

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TAR PRODUCTS MARKETS

CHEMICAL tar products, such as the phenols, naphthalene and pyridine bases, have grown markedly more important in latter years, particularly with regard to their usage in chemical industry. Recently, Mr. L. W. Blundell, Controller of By-Products, North Thames Gas Board (see also CHEMICAL AGE, 17 May p. 917) at the annual meeting of the Institution of Gas Engineers, dealt with the marketing of gas works products including chemical tar products.

Sales of tar products are influenced by demand both at home and abroad as well as by developments in organic syntheses. Mr. Blundell noted that it has been developments in the fields of moulded plastics, synthetic resin-bonded materials, plasticisers, synthetic fibres, therapeutic chemicals and insecticides, that had accounted for the greatly increased output and sales of phenols, pyridine and napththalene since the second World War.

Naphthalene is, of course, the essential raw material for the production of phthalic anhydride, which is the basis for the alkyd resins. Because of the usage of these resins in the manufacture of nitrocellulose lacquers for the motor industry, a considerable trade has grown up in naphthalene exports to the US as well as in the home market.

The market for naphthalene for phthalic anhydride production is not yet satisfied, reports Mr. Blundell, and he feels that there is plenty of scope for increased output.

One pound of crude naphthalene, it is estimated, can be obtained from one gallon of tar. In fact, the basic source of supply is from tar processing. In the UK the amount of crude tar distillate produced in the years 1954, 1955 and 1956 was 2,770,000 (long) tons, 2,778,000 tons and 2,868,000 tons respectively.

In this country and in France, gas works tar is the important source. In the US and Germany, the main source is tar produced in coke ovens. The total naphthalene (including crude, whizzed, pressed, pure, etc.) produced in the UK during the years 1954 to 1956 is estimated as follows: 49,000 tons; 50,000 tons; and 52,000 tons. The increase in naphthalene production in 1956 is believed to be due to additional plants coming into operation.

Now, of the 2.8 million (long) tons of tar distillate, about 1.5 million tons are obtained from vertical retorts, which tar contains about 3 per cent of naphthalene, and 1.3 million tons is high temperature tar containing 9 to 10 per cent naphthalene. However, it is difficult to estimate the recovery of naphthalene industrially. It is suggested that 1½ to 2 per cent is recovered in the case of gasworks tar and 7 to 8 per cent in the case of coke oven tar. The total amount recovered in latter years has been estimated at between 100,000 and 120,000 tons, indicating that naphthalene is only half exploited in the UK.

Germany, on the other hand, recovers far more naphthalene compared with its tar output. The percentage produced of coke oven tar to gas works tar is of the order of 85 to 15 per cent. In the years 1954 to 1956 the amount of tar produced in Germany was 1,610,000 (metric) tons, 1,814,100 tons, and 1,904,000 tons respectively. From these totals was produced 87,280 (metric) tons, 77,522 tons and 86,603 tons. Germany has therefore been recovering

much more naphthalene in comparison with the output of tar.

In the US, *Chemical and Engineering News* (1958, 36, No. 20, 24) carries an interesting survey of the US naphthalene scene, as outlined by James N. Roche of Koppers Co. In the US, as in this country, there is plenty of naphthalene available—about 100 per cent more than normally recovered. This estimate is based on that from coke oven and import sources—not from petroleum manufacturers, although as yet, these have not really entered the field.

Phthalic anhydride demands in the US are estimated to reach 460 million lb. a year by 1965—but by that date some 1,000 million lb. of naphthalene could be available from coke ovens—enough to make 740 million lb. of anhydride. The amount of naphthalene separated is determined by the demand for anhydride and at present phthalic anhydride production takes up 80 per cent of US naphthalene.

Last year 415 million lb. (185,000 tons approximately) of naphthalene was recovered at US tar processing plants, At the same time, over the past 10 years imports of naphthalene from the UK and Eastern Europe have averaged 81 million lb. (36,000 tons approximately) a year.

Naphthalene which is not recovered from tar, ends up in road surfacing materials, etc., and in 1957 that use represented 317 million lb. naphthalene. The amount of naphthalene which was burned with tar (as a fuel), is estimated to amount to 140 million lb. Koppers' market survey, therefore, indicates a US naphthalene domestic potential of 872 million lb. (400,000 tons approximately) last year. In actual fact, some 600 million lb. was available, 415 million lb. recovered, 93 million lb. imported and about 100 million lb. stock from 1956. Of the total, 83 per cent was used to make phthalic anhydride and other naphthalene-derived materials.

Surveying the future, Koppers estimate that 980 million gallons of tar will be produced in 1965 by virtue of increased steel and coke oven capacity, giving a potential domestic naphthalene production of 980 million lb. If imports continue at the same rate, the naphthalene potential would exceed 1,000 million lb. From this total (minus 120 million lb. for other naphthalene-derived materials) some 740 million lb. of phthalic anhydride could be produced. Estimated demand for anhydride for 1965 is, however, put at only 460 million lb., although Koppers suggest 670 million lb.

There is no danger, however, of lack of naphthalene supplies for it is evident that US oil companies are interested in the naphthalene market. Two companies at present producing either anhydride or oxidation products from xylene fractions are Oronite Chemical and Amoco Chemicals. What does appear to be of concern to the US market are imports of naphthalene upgraded to phthalic anhydride. The incentive for European phthalic producers to enter the US market is, of course, the low tariffs.

TRANSPARENT MAGNETIC OXIDES

THE discovery of ferro-magnetism in a new class of magnetic oxides structurally distinct from ferrites, and known as rare-earth iron garnets, has been reported by the Laboratoire Electrostatique et de Physique du Métal of the Institute Fourier in Grenoble, France, and independently by research workers at the Bell Telephone Laboratories where the optical and magnetic resonance behaviour of the garnets is being studied, employing single crystals. (*J. Franklin Institute*, 1958, **265**, 144).

The new materials are transparent, permitting the internal magnetic domain structure to be seen with a polarising microscope; most magnetic materials, metals and ferrites alike, are opaque to visible light. The way magnetic domains are orientated within them has been inferred therefore.

The member of the new garnet family which has received most study is yttrium iron garnet, $Y_3 Fe_2 (Fe O_4)_3$. It has a curie temperature of 545°K and a spontaneous magnetisation at zero temperature and infinite field of 4.96 Bohr magnetons per molecule, close to the theoretical value of 5.0. This magnetisation is stated to result from superexchange interactions through O^{2-} ions between Fe^{3+} ions in crystallographically different positions in cubic lattice. The number of these interactions per Fe^{3+} ion in yttrium-iron garnet is reported to be 3/5 that in a ferrite and, correspondingly, the observed curie temperature of 545°K is 0.64 of that for magnetite (848°K).

The interesting part about yttrium-iron garnet is that it contains magnetic ions with only a single valence. From X-ray and neutron diffraction studies it has been found that, unlike the ferrites, the interactions between identical magnetic ions completely occuping two different crystallographic sites are responsible for ferromagnetism in the garnet structure in an adjacent and oppositely magnetised domain. This Faraday rotation makes the domains within the crystals clearly visible. The internal domain structure can therefore be studied over a wide range of temperatures and magnetic field conditions. Therefore, for the first time, it is now possible to correlate Faraday rotation in a magnetic material with spectroscopic data over a broad temperature range.

NEW ALDOSTERONE SYNTHESIS

A new, direct synthesis of aldosterone—the hormone that controls the salt balance of the body—starting with simple coal tar products has been achieved by a group of University of Wisconsin chemists headed by Professor William S. Johnson. The new method for making this hormone was announced at the 133rd national meeting of the American Chemical Society (ACS) in San Francisco.

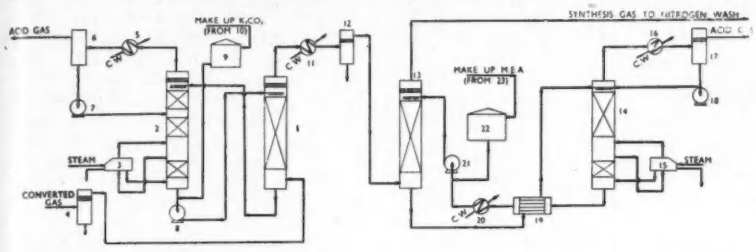
Professor Johnson has been awarded the ACS $1,000 prize for creative work in organic chemistry. The award was based on Johnson's previous research on hormones involved in sex, pregnancy, and life maintenance including the first total synthesis of the male sex hormone, testosterone, and the synthesis of the female sex hormone, estrone. His award address was 'A total synthesis study: objective, aldosterone'.

Chemical, physical and biological tests have shown that the Wisconsin-made aldosterone is extremely active, having 30 times more salt-retention potency than the artificial adrenal hormone called DOCA, or desoxycorticosterone acetate. Possibilities of its use in the treatment of such diseases as Addison's disease are at the moment purely speculative.

Normally, aldosterone can be isolated from adrenal glands in only trace amounts. Thus the only practical source is by synthesis.

Because of unusual structural features, attempts to produce the hormone by 'partial synthesis' starting with a natural steroid like cholesterol have failed. The first 'total' synthesis of aldosterone was achieved by Arthur Wettstein and his collaborators at Ciba, Switzerland, in 1955. The Wisconsin synthesis began with studies in 1954, and is basically different from that of the Swiss workers, although at the late stages the two necessarily converge. The Johnson approach starts with a readily-derivable coal tar product 1,6-dihydroxynaphthalene, which comprises rings C and D of the aldosterone hormone molecule. Ring B is next added, then ring A, and the compound thus formed is then put through more than 30 transformations during which the complex molecule gradually assumes the form of aldosterone. In the first time through, when the late stages were reached, only a few crystals remained but these were quite sufficient for conclusive identification.

Hot Potash with Amine Scrubbing System for CO_2 Removal



Flow diagram of combined hot potash/amine scrubbing system for CO_2 removal in a synthetic ammonia plant: 1 potassium carbonate [K_2CO_3] absorber; 2 K_2CO_3 regenerator; 3 regenerator reboiler; 4 knock-out drum; 5 acid gas cooler; 6 reflux tank; 7 K_2CO_3 reflux pumps; 8 K_2CO_3 solution pumps; 9 K_2CO_3 storage tank; 10 K_2CO_3 make-up tank and pump; 11 synthesis gas cooler; 12 knock-out drum; 13 MEA absorber; 14 MEA reactivator; 15 MEA reboiler; 16 acid gas cooler; 17 MEA reflux tank; 18 MEA reflux pumps; 19 MEA solution heat exchanger; 20 MEA solution cooler; 21 MEA solution pumps; 22 MEA storage tank; 23 MEA make-up tank and pump

ATTEMPTS to improve the economy of CO_2 removal and recovery processes are always being made and in the hot potassium carbonate system of CO_2 removal, substantial savings in steam may be achieved. This is stated by Mr. T. W. Sharp, chemical plant division of the Power Gas Corporation, in 'CO_2 removal and recovery' (*Power Gas Group Review*, May 1958, p. 8).

Mr. Sharp points out that the heat of reaction between potassium carbonate and CO_2 is less than half that for MEA: CO_2. Also, absorption and reactivation are carried out at substantially the same temperature so that no heat exchange is involved between the rich and lean solutions.

At the temperature (225 °F) at which potash is circulated, the bicarbonate is very much more soluble than in the older 'cold' process: consequently more concentrated solutions can be used with reduced flow rates and equipment costs. It is obvious too that the elimination of heat exchangers and solution coolers means a substantial saving in capital costs. Using a 40 per cent solution of potash, CO_2 is absorbed at pressures of 200 p.s.i.g. and over and desorption is effected with a reduction in pressure down to about 3 p.s.i.g.

Still the Major Charge

Although for those conditions in which its use is justified, the hot potash process shows steam savings over other systems, steam is still the major charge. Compared with amine scrubbing, the most favourable steam economy is achieved in those cases where the partial pressure of the CO_2 is high, that is where the inlet gas is at pressures of 200 p.s.i.g. and over and the CO_2 content is upwards of about 20 per cent. Under such conditions the greatest efficiency is attained when the CO_2 in the purified gas is reduced to a minimum of around 2 per cent. Reductions down to 0.2 per cent are possible but the steam consumption at those lower concentrations increases rapidly. New developments in the hot potash process hold out the promise of economically reducing the CO_2 down to even lower limits.

Mr. Sharp says that a combined hot potash/amine scrubbing system is an attractive possibility where large quantities of high CO_2 content gas under pressure are to be treated for complete purification.

The flow sheet diagram of such a system relates to a synthetic ammonia plant. The synthesis gases are produced at high pressure by the partial oxidation of a hydrocarbon stream: nitrogen from the air liquefaction plant is to be used for final purification. Synthesis gas enters the absorption system where the CO_2 content is reduced to 2 per cent by hot potash washing, subsequent amine absorption bringing the figure down to 0.02 per cent. A caustic wash completes the removal of the CO_2.

The alternative of water washing is normally excluded by reason of the fact that it only reduces the CO_2 content at best to a minimum of 0.2 per cent and the cost in caustic soda of lowering this to the not measurable state is prohibitive. Elimination of the CO_2 is essential at this stage to preclude the possibility of solid CO_2 depositing on heat exchanger surfaces, etc., during the low temperature liquid nitrogen washing.

The two-stage system is less costly in steam than either straight amine scrubbing or the combined cost of steam and caustic for hot potash alone. Steam savings more than compensate for higher capital costs.

Dr. Hill Seeks Chemical Industry Co-operation for Trial Tariff Run

CO-OPERATION of the chemical industry in the trial operation of the new UK tariff which is to be held this autumn before the tariff becomes effective on 1 January 1959 was asked for by Dr. Charles Hill, Chancellor of the Duchy of Lancaster, at the annual lunch of the British Chemical and Dyestuffs Traders' Association on 21 May.

Proposing the toast of the association, Dr. Hill referred to the impact of the Brussels nomenclature and said that under the new methods of classifying goods in the customs tariff, they would in future appear in one place only. The necessary order for the change would be laid before Parliament in June and the new tariff would be published in July.

He felt that the chemical industry would be concerned with many thousands of substances included alphabetically in the new list. The industry's co-operation was sought so that the new tariff would in fact achieve the aim of simplifying the task of firms in relation to Customs and Excise.

Although the UK share of world trade had fallen, Dr. Hill spoke strongly against pessimists who denigrated this country's achievements. Since 1947, Britain had doubled its exports and the chemical industry had played a great part in that. From 1955 to 1957 chemical exports had risen from £233 million to £267 million.

Between 1955 and 1957, the UK balance of payments earnings for exports and re-exports had risen between £3,076 million and £3,508 million. Between the first quarter of 1956 and 1957 exports to North America had risen by 13 per cent, and by 9 per cent to the whole of the dollar area. There was, he added, every reason to be proud of the past and confident of the future.

Replying to the toast, Mr. G. S. Bache (director, Reichhold Chemicals Ltd.), the retiring president, referred to the trade recession in the US, which had continued until quite recently. Now there would appear to be some signs of improvement, for labour was being re-employed in the key neighbourhood of Detroit.

Turning to Europe, Mr. Bache stated that the common market had become an established fact; there was some evidence of progress with the free trade area. The next 10 years would see extraordinary changes in the export and import trade, in which the merchant would play a very important part.

Proposing the toast of the guests, Mr. C. V. Blagden particularly mentioned Sir James Crombie, chairman of the board of Customs and Excise, Mr. G. M. Bennett, the Government Chemist, Mr. Bernard Hickson, chairman, and Mr. George Brearley, director, Association of British Chemical Manufacturers. He read apologies for absence from past-president Mr. Victor Blagden, who although now approaching 91 years of age was still able to get out and enjoy himself, and from Brigadier C. Norton Stafford (C. Tennant Sons and Co. Ltd.), who sent a telegram from San Francisco. Sir Andrew Clark, Q.C., responded for the guests.

THE crisis in French political circles will almost certainly mean the indefinite postponement of the UK proposal for a free trade area in conjunction with the European common market. Economics ministers from the six common market countries last week decided to shelve their main task, that of working out a common policy on the UK suggestions.

M. Maurice Faure, French Minister in Charge of European Affairs, is believed to have told the meeting that he had no powers to commit his Government on any major decision. The view expressed by M. Larock, Belgian Foreign Minister and president of the Common Market Council of Ministers, was that any programme in European unification largely depended on the situation in France.

The ministers were to have considered a draft memorandum worked out by a committee of experts for a common policy on a European FTA. My French correspondent says that 'usually well-informed sources' had stated that this memorandum was considerably closer to UK views than to the French viewpoint which was expressed in a confidential paper.

LAST year, ICI spent £8½ million on research and a further £5 million on development. On its payroll the company had about 1,600 research scientists and the total employed in its research departments was about 4,000. In addition a large number were employed on development.

Dr. J. Ferguson, ICI research director, at a Billingham long service ceremony asked if the company's spending on research was justified. Was the company gambling too heavily? Not unexpectedly his answer was 'No'. Dr. Ferguson instanced some of the company's great research triumphs.

In particular, since the war a new petroleum based industry had grown up at Billingham. So successful had basic research been on that and so successful had been the follow-up in design and operation, sales promotion, etc., that it had been necessary to form a new division at Billingham.

PROMISING headway towards commercial use of everything in a tree 'including the smell' is announced by the Pulp and Paper Research Institute of Canada. At the same time it is claimed that a practical method of recovery of sulphite liquors and other pumpmill effluents is now possible. A new process, expected to be ready within 12-18 months, will also be applicable to the treatment of other industrial wastes. It could, it is believed, be used in processes such as the roasting of sulphide ores and the drying of pharmaceuticals.

Known as the AST process (atomised suspension technique), the method has been successful in laboratory and pilot plant trials. The new system is also expected to provide for sulphite pulp mills a process to recapture cooking chemicals and heat in a recovery furnace as is now used in the production of kraft-type pulp.

In addition, the Institute is working on processing the 30 per cent of the tree which is now wasted when slash, leaves, needles, roots, etc., are discarded at the time of felling. These waste products might be transported to the mills by pipelines, conveyor belts or monorail. Work is also proceeding on the problem of utilising gaseous emissions of pulp mills.

THOSE delights of the gourmet, morel mushrooms, that have only grown wild in the past can now, thanks to chemical research, be grown in chemical plant. After 10 years of research by the US company Yorktown Products, the Battelle Memorial Institute has developed a method to grow the mushrooms.

This is done in a sterile area in vats of pure, aerated nutrient fluid. Time taken to grow the mushrooms to full commercial size is said to be only 72 hours. Mushrooms by this process are stemless and full bodied. They can be cooked, dried, powdered, canned or frozen, without, it is claimed, loss of flavour or vitamin content. These mushrooms are now being grown by Commercial Solvents, Terre Haute, Ind.

According to Battelle workers the process shows 'the possibility of growing many other types of food in unlimited quantities in any climate.'

THE warning note sounded by me two weeks ago (CHEMICAL AGE, 17 May) on the danger of supplying hard-won chemical process and engineering know-how to the Russians has been echoed more strongly by a correspondent in *The Scotsman* last week. Mr. P. S. Davison writing in that paper said 'The West, having pioneered the elucidation of the detailed methods of the chemical industry, thus risks finding itself beset by a rival from the East who, by purloining the techniques of the West, can afford to outbid the West from the world's markets'.

Mr. Davison hopes that the opportunity of immediate trade gain will not be allowed to disguise the short-sightedness of giving up detailed technical information to a formidable rival. 'Industrial know-how will be as valuable in the coming war by trade as it has been in the war by threat of nuclear arms.'

This subject, referred to briefly by Sir Alexander Fleck at Manchester last week (CHEMICAL AGE, 24 May, p. 951), is likely to be a highly controversial one. It is one thing to help the USSR modernise its chemical and synthetic materials industries with new plant and equipment; quite another to hand over the vital process know-how. This would enable the Soviet to pull back the lead now held by the West in the sphere of chemicals in a few years—the time it takes to construct the necessary plants. I believe that the decision as to whether the West parts with know-how should be made at Government level.

LEGISLATION will come before the present session of the West German Parliament with the aim of setting up tolerances for the use of residual insecticides. It is believed that certain insecticides will not be permitted where application on certain vegetables and fruits is concerned.

In the confident belief that Germany's imports of pyrethrum will increase considerably, and possibly double the rate of 360,000 lb. of extract imported in the first quarter of this year, the German sales agents for the African pyrethrum interests are to be backed by a £7,000 advertising and publicity campaign.

Initially this campaign will be aimed at the bulk buying trade, to be followed by insecticide manufacturers and then the general public. The pyrethrum exhibit at the recent Crop Protection and Pest Control Exhibition in London was visited by representatives of BASF.

THE recent commissioning of the new electrolytic peroxide unit of Canadian Industries Ltd. at Hamilton, Ont., is stated to boost the company's hydrogen peroxide production facilities to handle fully all present and foreseeable Canadian needs. It seems that the H_2O_2 market in Canada will soon see some keen competition, for Du Pont of Canada are nearing completion of their new plant to make hydrogen peroxide via a 'chemical reaction route'. Du Pont also claim that their new plant will have the capacity to handle all of Canada's needs.

Previously a certain part of Canada's mounting hydrogen peroxide demands have been met by imports from the US. The only commercial manufacturing unit in Canada has been the electrolytic plant of CIL at Shawinigan Falls. This is to be closed because of the large capacity of the new Hamilton unit which uses the Becco electrolytic process, licensed to CIL from the Becco chemical division of US Food Machinery and Chemical.

The Du Pont plant is being erected at Maitland, Ont., and is expected to be completed in the autumn. Neither company will state the capacities of their plants.

Alembic

GEIGY CELEBRATING 200 YEARS IN CHEMICAL INDUSTRY

Expansion and Development Policy

WITH the celebration this year of the 200th anniversary of their Basle parent company, Geigy (Holdings) Ltd. are vigorously following a policy of expansion and development. Already this year new units have been commissioned for the large-scale production of sebacic acid, increasing output by 40 per cent, and phthalocyanine pigments. Other developments, either in hand or under consideration, include the building of large facilities in North Wales for the subsidiary that produces plasticisers and other chemicals, Ashburton Chemical Works Ltd.

To see something of Geigy progress in the UK, a CHEMICAL AGE staff reporter recently visited the UK head offices at Rhodes, Middleton, near Manchester. The research and technical service laboratories are sited there; the Geigy Pharmaceutical Co. at Wythenshawe; Ashburton Chemical Works at Trafford Park; and James Anderson (Colours) Ltd., the pigment producing unit, at Paisley.

Before the war the Trafford Park works pioneered, so far as Geigy are concerned, the production of chemicals for the plastics industry, and the laboratories at Rhodes continue to contribute new ideas to the company's world-wide organisation.

All Divisions Carry Out Research Work

Research and development work at Geigy are carried out by each of the historically established divisions covering dyes and textile auxiliaries, pigments, plasticisers and so on. There is also a separate section whose function is to study the application of Geigy products to those industries not covered by the established sales divisions. Among the projects now envisaged is a study of the application of organic chemicals in the metal industries, including electroplating, de-rusting, etc.

Included in this work are organic chemicals for use in the production of rare metals and a Geigy product is now used in the separation of rare earth elements. Among other uses for Geigy metal treatment chemicals are cleaning and pickling, degreasing, fluxing, electroplating, rinsing, phosphate coating and de-rusting. Their two non-ionic surface active agents for metal usage are Belloid M3 and M7. Both are extremely stable to acids, alkalis and oxidising agents.

This section of the Rhodes laboratories is now bringing into use a new electroplating laboratory, fully equipped for pilot scale production.

The beginning of the company's plasticiser section was marked in 1933 with Geigy Manchester's first patent in the names of H. Clayton and H. Jones. By 1939, 68 products were being produced in Manchester. Besides plasticisers these included dyeing assistants and finishing products, tanning agents, dispersing and rot and fire-proofing agents and tartar emetic.

The first of the range were the triaryl phosphate plasticisers used for their fire-retarding properties in cellulosic plastics and surface coatings. During the war the company began to produce speciality phthalate esters, in particular dimethylglycol phthalate which is used in cellulose acetate cable lacquers, and more recently, in cellulose acetate staple fibre wadding.

Since 1945, interest in sebacate plasticisers has also developed. In that year, Geigy UK undertook the production by a US process of sebacic acid, becoming the first company in Europe to produce this versatile raw material in commercial quantities. There is now one other European producer—a French firm, who manufacture under licence. Produced from castor oil, sebacic acid finds use in the manufacture of esters not only for plasticisers but also for synthetic lubricants and in the production of 6:10 nylon.

Dialkyl sebacates (dibutyl, dioctyl esters, etc.), have a low viscosity/temperature sensitivity which means that when incorporated as plasticisers into p.v.c. or synthetic rubber they give those materials high resilience and reduce their sensitivity to temperature changes. This property is also of value to the aircraft industry and esters of the higher dialkyl sebacates are now being increasingly used for synthetic lubricants in turbo-prop and turbo-jet air engines, which have a running temperature of about 200°C, but which may have to be started at arctic temperatures.

Phosphate Plasticisers Still Produced

Geigy continue to produce triaryl phosphate plasticisers in large quantities and new uses are being found. Triphenyl phosphate (TPP) is used in triacetate X-ray films, and tritolyl phosphate (TTP), because of its fire-resistant properties, is a plasticiser for p.v.c. coalmine belting. TTP is also used in Admiralty foul-weather clothing and in flooring materials. The largest outlets for Geigy's triaryl phosphates are as additives for petrol and lubricating oils and in p.v.c. belting.

One of the main tasks of the physical laboratory is the evaluation of potential new plasticisers made in the organic chemicals laboratory. The search for better and cheaper plasticisers is a continuous one and among new raw materials to be evaluated are intermediates from the petroleum source.

Much work has been done in a programme of study of the behaviour of plasticisers in p.v.c. This includes the development of plasticisers for the production of foamed p.v.c.

Geigy, who have been represented in the UK by agencies since 1886, formed their first company here in 1920, when the Geigy Colour Co. Ltd. was set up in Manchester with a capital of £10,000. This was increased to £20,000 in 1923; today the capital of Geigy (Holdings) Ltd., recently increased by £1¼ million, is £2,100,000.

Geigy Holdings head the group's selling, manufacturing and research and development companies. The Geigy Co. Ltd., also at Rhodes, are headquarters of the administration, sales, technical service, research and development units; Geigy Pharmaceutical Co. Ltd., Wythenshawe, handle the sale of specialised pharmaceutical products.

The manufacturing units are Ashburton Chemical Works Ltd., Trafford Park, Manchester, and James Anderson and Co. (Colours) Ltd., Paisley. Research and development companies are Aliphatic Research Co. Ltd. and Gyl Chemicals Ltd., both in Manchester. The Clayton Aniline Co. Ltd., owned by the Basler Interessengemeinschaft which was formed by Ciba, Geigy and Sandoz in 1918, produce dyestuffs for the three companies. Two overseas companies—Geigy (Australasia) Pty. Ltd. and Geigy South Africa (Pty.) Ltd., formed on the initiative of Geigy UK, have this year been incorporated into the Geigy world organisation and are no longer direct subsidiaries of the UK company. Another major development this year has been the agreement reached between Geigy and Fisons Pest Control Ltd. on a mutual policy of research manufacturing facilities and distributive services in the field of agricultural chemicals.

Paisley Plant Built for Phthalocyanines

Recent extensions at Paisley include new plant specially designed and built for the production of phthalocyanine colours; this plant, among the most up-to-date in the world, is based on the experience of the parent company, which has been making phthalocyanines for many years. The introduction of four brands from Paisley has completed the first stage of the manufacturing programme, providing a phthalocyanine blue each for the printing, paint and plastics industries, as well as a new type with a very bright clear shade for use in all three fields and many others.

Three aspects of pigment production on which Geigy are now concentrating are improved stability to light and heat, made necessary by the use of ever higher temperatures for stoving paints and compounding plastics; greater solvent resistance, called for by the more powerful solvents needed to cope with the newer resins; and easier dispersion of pigment pastes and powders in the medium.

The companies in this country today employ nearly 1,700 people, of whom about 200 are engaged on scientific and technological work. The group is so organised that the fruits of research and production experience are centrally co-ordinated and, wherever possible, the knowledge gained by each member is made available to the organisation as a whole.

With a turnover of about £10 million a year, the UK group is the second largest unit in the Geigy world organisation. More than 60 per cent of sales are now in chemicals other than dyestuffs, the product on which the world-wide Geigy interests were set up 200 years ago.

The parent company in Basle still bears

the name of its founder, Johann Rudolf Geigy and, despite its development throughout the world with more than 50 associated companies and a total payroll of 8,000, J. R. Geigy AG are still essentially a private concern. The global expansion has been achieved largely by self-financing and a steadfast policy of ploughing back profits. Total turnover of the Geigy companies is SW.Fr.570 million, of which the UK companies' contribution is about one-fifth.

Originally a merchanting business, the first of the Swiss company's own dyewood mills was mentioned in 1833. In 1859, only three years after Perkin discovered the first synthetic aniline dye, the founder's son, through an associate, began to produce Fuchsine (magenta) which was soon followed by other coal tar dyes. Geigy synthetic dyestuffs soon became established throughout the world. Between the 1860's and the 1880's the company had set up agencies in Spain, New York, Bombay and England. Already there was a subsidiary plant in Tsarist Russia. Until 1930 Geigy had been making and selling little else besides textile dyestuffs and tanning materials. Systematic development research into new fields in the middle 1920's led the company into synthetic tans, textile chemicals and auxiliaries. The UK company made a major contribution in the field of plastics chemicals. Textile chemicals led Geigy to mothproofing agents and into the field of biology. It was a natural step into the wider problems of pest control and eventually also into pharmaceuticals.

In Britain in particular Geigy have been responsible for the development of barbiturates, of which they are one of the world's largest manufacturers. Forty per cent of their barbiturate production is sold overseas and the exports go to almost every country.

One of the group's most spectacular successes came when Paul Müller, working in Basle in 1941, achieved a breakthrough in the field in which many chemists were then working and discovered the insecticidal properties of DDT. In 1948 he was awarded the Nobel prize for physiology and medicine. Through their UK companies, Geigy are continuing to break new ground, first with the sebacates and now with surface active agents for the metal industries.

The post-war development of synthetic fibres has formed a bond between the oldest of the company's products, dyestuffs, and the more recent plasticisers and other plastics chemicals.

It is difficult to visualise what fresh fields Geigy will explore in future years, but it is certain that the UK units will continue to play a major part in developing new products.

Laboratories for Food Chemistry

MODERN laboratories comprising five sections and occupying 10,000 sq. ft. have been established by T. Wall and Sons Ltd. at their Acton, London, works. Under the direction of Dr. S. M. Herschdoerfer, the company's chief chemist, they are equipped to carry on investigations of all scientific aspects of the manufacture of ice-cream and meat products, together with the routine examination of raw materials and finished foodstuffs.

These laboratories carry out most of the basic research work for all Wall's factories. In addition there are routine control laboratories attached to the individual factories up and down the country. Wall's can also call on the research facilities of the Unilever group as a whole.

Pilot plants equipped with full-scale machinery are capable of reproducing the manufacturing processes of both ice-cream and meat products factories.

Pre-fabricated plumbing units have been used throughout, giving considerable freedom in the lay-out of the benches. Formica was chosen for the bench-tops, except for some cases where slate offered some advantages.

In the analytical laboratory examinations are made of almost everything used in the various factories; raw material and finished goods, and the materials in which they are packed. Ice-cream is analysed rigorously. All the important constituents—protein, fats, milk solids and sugar and even trace elements—are recorded.

The basic characteristics of Wall's products are investigated in the physical laboratory. A certain amount of fundamental work is also carried out.

This plastometer, used in the biochemical and physical laboratory at Wall's for the determination of viscosity, is of an advanced design. There are only about four in the country

In Parliament

Scientific Attaché for Moscow Embassy

THE Government is to appoint a scientific attaché at the British Embassy in Moscow to advise the British Ambassador on scientific matters and to report on scientific and technical research and development in the Soviet Union. This was stated in the House of Commons last week by Mr. H. Nicholls, Parliamentary Secretary, Ministry of Works.

Motion to Annul Alkali Order Withdrawn

A motion to annul the Alkali, etc., Works Order 1958, on the grounds that it transferred from local authorities to the Alkali Inspectorate powers in regard to the enforcement of clean air policy, was recently withdrawn. The motion was introduced by Mr. G. Nabarro.

Winding up the debate, the Minister of Housing and Local Government said he would use his powers in such a way that the Alkali Inspectorate had every opportunity to get on with the stimulation of scientific research where there were technical problems unsolved. The Inspectorate should co-operate as closely as possible with the local authorities, and where an authority was qualified to take over the work an order would be made to enable it to do so.

Scientific Research Enquiry

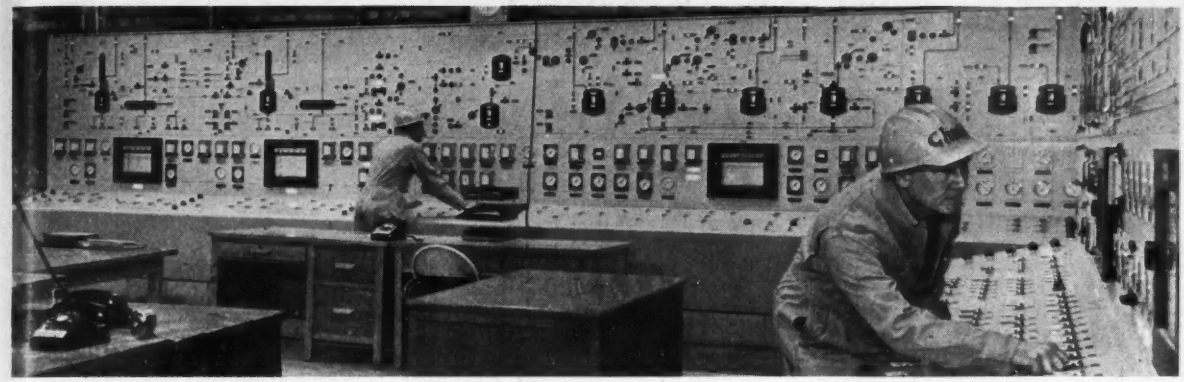
THE Lord President of the Council has set up a committee to enquire into the techniques employed by Government departments and other bodies wholly financed by the Exchequer for the management and control of research and development carried out by them or on their behalf. Membership of the committee, which will make recommendations, is as follows:

Sir Claude Gibb, chairman, C. A. Parsons and Co. Ltd.; Dr. W. Jackson, director of research, Metropolitan Vickers Ltd.; Dr. R. P. Linstead, Rector, Imperial College; A. A. Part, Under Secretary, Ministry of Education; Sir Solly Zuckerman, Professor of Anatomy, Birmingham University. Mr. D. Neville Jones, office of the Lord President of the Council, will be secretary.

Composition of Milk Committee

A NEW committee set up by the Ministry of Agriculture, Fisheries and Food is to consider 'the composition of milk sold off farms in the UK and from the standpoint both of human nutrition and of animal husbandry and to recommend any legislative or other changes that may be desirable'.

Dr. J. W. Cook, Vice-chancellor of Exeter University, will be chairman. Other members of the committee are: Professor R. G. Baskett, F.R.I.C., S. Clifford, Miss R. L. Cohen, Professor E. L. Crossley, F.R.I.C., Dr. D. P. Cuthbertson, Dr. P. R. Evans, G. N. Gould, Professor W. Holmes, H. E. Magee, Professor B. S. Platt, Dr. A. Robertson, Dr. R. Waite, A.R.I.C., H. L. Webb, and Dr. E. C. Wood, F.R.I.C.



A portion of the control panel that monitors the entire high energy fuel producing process. The nerve centre is part of the first full production plant for boron-based chemical fuels, located at Model City, New York

Free World's First Boron Fuel Plant on Stream

THE western world's first full-scale production plant for high energy boron-based fuels was brought into operation on 14 May. At the same time it was announced that for the first time high energy fuel could now be made as a solid rocket fuel that is 'hotter' than solids currently used.

The high energy fuel plant was built by Olin Mathieson Chemical Corporation for the US Navy, the service that originated research of boron fuels. Rear-Admiral L. D. Coates, assistant chief, Bureau of Aeronautics for Research and Development, turned a valve that put the plant into production after a signal from Washington. He said at the ceremonies that the Navy's portion of the fuel will be used for further development work. He cited an urgent need for continuing research and development in this field.

Dr. L. Kermit Herndon, vice-president and head of Olin Mathieson's high energy fuels division, reported that shipments will be made to both the Navy and Air Force.

The Navy plant will produce liquid HEF-2. The plant was built at a cost of $4,500,000. Adjacent to it, construction continues on a $45 million Air Force plant, which is scheduled for completion by May 1959.

Demonstration Apparatus

A special demonstration apparatus burned hydrocarbon fuel used in jet aircraft today and the new chemical HEF-2. They were ignited simultaneously and were burned side by side in a single chamber. Oxygen was reduced in the chamber to simulate an increase in altitude. The jet flame from conventional fuel flickered and died while the green-tinged HEF flame continued to burn steadily.

The example was used to show that the new chemical fuel, because of its greater heat and other properties, continues to burn at higher altitudes than present jet fuel—thereby improving the combustion performance.

The new Navy plant will mix boron, hydrogen and other chemicals to produce HEF-2. The three-stage process uses an intermediate, followed by a secondary intermediate, and finally the finished product, which is believed to be a pentaborane derivative. A decaborane derivative has been mentioned in connection with the liquid fuel that will be produced for the Air Force.

Dr. Herndon explained that a solid fuel became a solid propellant when mixed with an oxidiser. He pointed out that high energy fuels were now under development in the area.

Greater Specific Impulse

Dr. Herndon reported that the solid high energy fuel had greater specific impulse than solids currently used. He described specific impulse as the thrust of a pound of fuel multiplied by the number of seconds it takes to burn, adding 'It takes only a change in the chemical structure to change the liquid into a solid'.

The new fuels have been designated HEF-2, 3 and 4. HEF-3 will be made in the Air Force plant now under construction, and HEF-4 is now being made on a pilot plant basis. The numbers designate certain changes in the fuel for testing purposes.

Dr. Herndon also reported that laboratory quantities of fuels beyond HEF-4 are now being made by the company. He said they can further increase the range of air-breathing engines, using the best present-day jet fuel as a comparison.

The price of the fuel is still in the classified category, 'but recent development is said to have brought down the price sharply. Large-scale production prices are expected to be moderate and within a range that will permit extensive use of the fuel'.

Dr. Herndon said that the problem was to combine boron, hydrogen and other chemical elements in proportions to give the optimum combination of BThU's per lb., safe handling characteristics and economy of manufacture. The 'breakthrough' was made within two years at the Niagara Falls facilities. The fuel developed by Olin Mathieson is to be produced by other companies to give an assured supply from several sources.

On completion of the Air Force plant, the company's high energy fuels capacity will be 2,750 times greater than in 1952–55 when fuels were made in laboratory size units.

ICI Buy Big Estate at Runcorn

A BIG estate on the outskirts of Runcorn has been acquired by ICI's general chemicals division. This was announced by Mr. C. G. Harris, division research director, at the mayoral dinner given by the new Mayor of Widnes last week. Mr. Harris said 'It was still much too early to attempt to detail the industrial processes which might be located there, but you can take it that the land purchase signifies the complete confidence of the company in the future of Merseyside as a location for the chemical industry'.

In his speech, Mr. Harris said: 'There is one thing which is characteristic of the whole story of the chemical industry and that is, as soon as one process goes another seems to come up to take its place'. Sixty years ago, Widnes made some ten important products. The main one was soda ash by a process which had since become obsolete. Today, no soda ash was made in Widnes but instead it had 60 important products to a value far in excess of what it was 60 years ago, even making allowance for the changes in money value.

Mr. Harris said that ICI received 30 per cent of its revenue from products which were not on the selling list 20 years ago.

1959 Lisbon Trade Fair

The next British trade fair in the Federation of British Industries' programme of overseas fairs will be held in Lisbon from 29 May to 14 June 1959. It will be organised by British Overseas Fairs Ltd., a subsidiary of the FBI, and is to be comparable in size to the one held at Helsinki in 1957. Copies of the brochure 'British Trade Fair Lisbon' have been sent to UK manufacturers and to agents in Lisbon.

Analytical and Physical Chemistry Investigated in NPL Divisions

EXPLORATORY work on the possibility of measuring raw sugar solutions without clarification using the photoelectric polarimeter has been carried out in the light division of the National Physical Laboratory in 1957.* The effect of variation of the wavelength of the light source on measurements of optical rotation has also been investigated.

An automatic recording saccharimeter in which the measuring unit is self-contained and has no moving parts has been built. Concentration of sugar is measured as it passes through the measuring cell. The prototype was arranged to measure a 70 per cent sugar solution at 70°C flowing continuously and gave good results when tried out on a confectionery manufacturer's plant. Subsequently the prototype was modified to cover three ranges of concentration, 0–0.6 per cent, 0–2.5 per cent and 0–6 per cent, for further trials at a sugar factory.

Effects of heat treatment on the mechanical properties of titanium-rich alloys of titanium, aluminium and oxygen have been studied in the metallurgy division and the investigation is now complete. A report on this work has been prepared.

The effect of controlled rates of cooling on the microstructure and hardness of a large range of binary titanium alloys is being investigated. It has been found that the rate of cooling which produces maximum hardness varies with the alloying element added.

Niobium is also being investigated. This metal has advantages over such metals as titanium and vanadium in its affinity for carbon and nitrogen. The properties of the metal are such that it may have applications as a constructional material in certain parts of atomic power plants.

Conditions for the application of the vacuum-fusion method for the determination of oxygen, nitrogen and hydrogen have been worked out for niobium and hafnium. Analyses samples of these metals have been made. A new apparatus to replace the one built 23 years ago is being assembled.

A standard chemical method for the determination of nitrogen in steel has been developed by the division and accepted by the British Standards Institution for inclusion in its standard analytical procedures.

Much of the research work of the metallurgy division's chemistry section has been devoted to the determination in metals of trace impurities at very low levels. A solid-source mass spectrometer has been ordered but delivery is not expected for another 18 months.

Attention has been concentrated on neutron activation analysis. A thorough examination of the impurities in a sample of 'super-pure' aluminium from the pure metal committee's stock was made and nine elements were determined at the part per million level. Good agreement was obtained with the results of previous chemical determinations. Three hitherto unsuspected impurities were discovered.

An American method for the separation of niobium and tantalum involving anion exchange resins has been examined and found to be superior to cellulose chromatography, particularly in the presence of titanium.

The heats of combustion of a number of pure organic chemicals have been measured by the physics division. Demand for liquid helium from the division has averaged about 20 litres a week. Recently it has shown signs of increase.

**Report of the National Physical Laboratory for 1957. HM Stationery Office 6s 6d.*

Jenolite Metal Pretreatment Materials

Two new materials for the chemical pretreatment of metal surfaces have been introduced by Jenolite Ltd., 13–17 Rathbone Street, London W1.

The first of these, called Jenotan, is described as tannin phosphate pretreatment for ferrous metals. Recent discoveries in the archaeological field, says the company, have shown that the presence of vegetable tannins in soil contributes largely to the protection of buried metal articles against the corrosive action of bacteria and other hostile agents. This is believed to be due to the formation of a self-healing coating of tannates, which shields the surface from chemical erosion as well as being resistant to attack by micro-organisms.

Suggested uses for Jenotan include, all cast and mild steel pipelines, steelwork subject to constant dampness, storage tanks, all steelwork which is sited in inaccessible areas.

Second of the new products is Jenocote which, it is claimed, will bond to all ferrous and the majority of non-ferrous metals, with particular reference to aluminium and its alloys and zinc or zinc coated surfaces. When applied to descaled, derusted or even lightly rusted steel it is claimed that it will provide excellent corrosion resistance.

Stoving enamels can be applied to a Jenocote surface and force-dried in a convection oven or by infra-red radiation.

Extensions at Grangemouth

Plans for a two-storey extension, costing approximately £10,000, to the research laboratory in Bo'ness Road, Grangemouth, of British Hydrocarbon Chemicals Ltd. were approved on 21 May. Permission was also given to Imperial Chemical Industries Ltd. to make alterations to their premises at Earl's Road, Grangemouth at a cost of £4,612.

Dangers of Aerial Spraying of Hormone Weedkillers

DANGER by drift to susceptible crops from the aerial application of hormone weedkillers such as 2,4-D and MCPA were discussed by the British Weed Control Council at its recent meeting. The hazard is said to be greatest when low volume spraying is practised. The dangers of applying these chemicals from aircraft, particularly fixed wing aircraft using atomisers are greater, for in the small fields of this country it is almost impossible to ensure that all the spray reaches the target area.

The council feels strongly that it should be widely known that aerial spraying of hormone near susceptible crops, such as tomatoes, cruciferous crops, beet, orchard trees at flowering time, lettuce and glasshouse crops, is a dangerous practice and should be avoided.

It is also stated that sodium arsenite, an efficient weedkiller recommended for weed control in bulbs and for potato haulm destruction, should never be used on other crops because of its highly poisonous nature.

German Big Three Ploughing Back Some Turnover

WEST Germany's three leading chemical companies, Badische Anilin und Soda Fabrik, Farbenfabriken Bayer and Farbwerke Hoechst will continue to plough back 14 to 16 per cent of turnover, the chairmen announced this week.

Investments by the 'big three' totalled £75 million last year and a capital assets expansion of £70 million is anticipated this year. Turnover in the first few months of the year has been above the 1957 level and so far there has been no sign of a recession.

There are, however, fears that US chemical companies might consider invading markets which they have not previously entered.

Germany is exporting 25 per cent of her chemical output, the US only 6 per cent. Germany is at present the fourth largest maker of chemical goods in the world, with an output estimated at $6,500 million in 1957. US output is estimated at $43,800 million, Soviet production at $13,000 million, and Britain holds third place, with an output of $7,300 million.

Details of the three companies' annual reports were given in CHEMICAL AGE, 10 May, p. 881.

Manchester University Expansion

To cater for a proposed increase of a quarter in the student population, Manchester University are planning building developments costing more than £4,760,000 between now and 1963. Final agreement on detail had not yet been reached with the University Grants Committee, but the number of students suggested was 8,000. From 1945–57 Manchester University spent £3 million on buildings, and among projects at present under construction or planned to begin in 1958 are science buildings, two new halls of residence, new refectories and a residential tower.

STRUCTURE AND DRUG ACTIVITY — 5

Anti-convulsants, Hypnotics & Sedatives

By

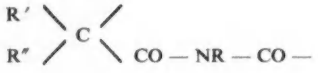
PETER COOPER

F.P.S., F.C.S.

THE three classes of drugs—anti-convulsants, hypnotics and sedatives—have in common the power of depressing unwanted or over-activity of the central nervous system. Although their activity in this respect is not entirely restricted to depressing distinct brain structures, so that their anticonvulsant action, for example, may be exerted without any sedation, in the main anticonvulsant activity affects a specific brain focus whereas sedation or hypnosis involves a more diffuse area. Indeed, sedation is undesirable in a patient being treated for epilepsy who wants to follow an ordinary occupation. The newer tranquillisers, which appear to interfere with nervous pathways in the thalamus and adjacent brain centres, have been the means of throwing much light upon mental processes both normal and pathological.

Sequence

Most anticonvulsant drugs are derived from the sequence:



where R is alkyl or hydrogen, R′ and R″ alkyl, aryl or hydrogen. When R′ or R″ = phenyl, or R′ = R″ = phenyl, anticonvulsant potency tends to reach a peak. In most compounds the sequence forms a ring structure, and most anticonvulsants are derivatives of hydantoin, oxazolidine-2,4-dione or barbituric acid. Comparatively few anticonvulsant derivatives of straight-chain compounds are clinically effective. 5-phenyl-5-ethyl-hydantoin, the earliest drug of the series, proved far too toxic in practice, but its 3-methylation yielded methoin, a safer drug, whose activity nevertheless appears to depend upon its metabolic demethylation to the 5-phenyl-5-ethyl compound. Methoin sometimes causes aplastic anaemia. 5,5-Diphenylhydantoin (phenytoin) remains the most useful and generally least toxic antiepileptic drug, notwithstanding its 15 per cent incidence of toxic reactions, which include some serious blood-cell disorders.

For a hydantoin to be potently anticonvulsant, at least one 5-phenyl group seems necessary; further 3-alkylation intensifies the action and widens the antiepileptic spectrum of the drug. The 5,5-diisobutyl compound is exceptional in having roughly the potency of phenytoin, though it is not clinically used. A thienyl derivative, 5-phenyl-5-(2-thienyl)hydantoin (phethenylate) had a short clinical life until its side-effects, including liver necrosis, condemned it as dangerous. No compound has yet been found approaching phenytoin in value and relative safety, and there is little encouragement to further research.

Replacing the 1-imide link of the hydantoins by oxygen produces the oxazolidinediones. The 5,5-dipropyl compound is markedly anticonvulsant but also hypnotic. Short alkyl substituents at position 5 tend to increase the anticonvulsant potency and reduce the hypnosis, while the alkylation of nitrogen 3 enhances the anticonvulsant action (as with the hydantoins) but introduces a new analgesic factor. Potency falls if sulphur takes the place of oxygen in the 2-carbonyl group. Two comparatively mild drugs used clinically are 3,5,5-trimethyloxazolidine-2,4-dione (troxidone), which is a low melting point solid, and the 5-ethyl-3,5-dimethyl homologue (paramethadione), a liquid which requires encapsulation. Both have occasional toxic effects upon blood-cells. They are ineffective against *grand mal*, but are useful against *petit mal* seizures. Other active congeners are the 5,5-diphenyl and 5,5-dimethyl-3-ethyl compounds. Unsaturated substituents weaken the activity, but 3-allyl-5-methyloxazolidine-2,4-dione has clinical uses.

The α-phenylsuccinimides increase in anticonvulsant potency when the nitrogen is alkylated, methyl being most potent. N-methyl-2-phenylsuccinimide (phensuximide) is used against *petit mal*, but is ineffective against other types of seizure. 5-Ethyl-5-phenylhexahydropyrimidine-4, 6-dione (primidone) is useful against all types of epilepsy, and has only a slight sedative action in adequate anticonvulsant doses. It differs from phenobarbitone only in having a methylene group in place of the barbituric carbonyl.

Phenylacetylurea (phenacemide) is a straight-chain analogue of 5-phenylhydantoin, with rather feeble activity. Its toxic actions include damage to blood-cells and depressive personality changes which render its use dangerous. Its potency is not markedly altered by aliphatic substitution on the amide nitrogen. α-Phenyl-α-ethylacetylurea is twice as potent as phenacemide and less toxic. The response of epileptics to drugs is so highly individual, and the seizures are so mixed in type that the straight-chain compounds, despite their toxicity, are likely to retain some place in therapy.

Not markedly anticonvulsant is 5,5-diethylbarbituric acid (barbitone), but the 5-phenyl-5-ethyl compound combines both hypnotic and anticonvulsant powers. 5,5-Diphenyl and 5,5,3-trimethyl barbituric acids are far weaker anticonvulsants. In general, 5-phenyl-5-alkyl acids are most potent when alkyl is small, and are more powerful than the diphenyl compounds. There is maximal activity in the 5-phenyl-5-butyl and 5-phenyl-5-crotyl acids. 3-Methylation increases the anticonvulsant potentialities and decreases the hypnotic ones.

As hypnotics and sedatives the barbiturates are unrivalled. However, they carry the hazards of overdosage and true addiction liability. Both hydrogens in position 5 need substitution with aryl, alkyl or a mixture of both groups. After an aliphatic chain of 5 carbon atoms their potency starts to decrease, the higher homologues developing stimulant potentialities. Straight-chain substituents confer longer activity than branched-chain. Short unsaturated chains prove more potent than the corresponding saturated chains. Alkyl groups at position 1 or 3 introduce stimulant tendencies, while simultaneous substitution at both positions creates frank convulsants. Metabolic destruction, and therefore rate of action, is speeded when sulphur replaces oxygen in the 2-carbonyl group. The barbiturate skeleton offers a vast number of distinct compounds, and the sedative or hypnotic action of the drugs may be tailored to suit requirements.

Unsaturated Aliphatic Carbinols

The unsaturated aliphatic carbinols have varying hypnotic and anticonvulsant properties. 3-Methylpentyn-3-ol (methylpentynol) is a safe agent for sedation, though its activity is too short-lived for most purposes. Its carbamate ester is more potent, dose for dose, and its duration of action five times as great as that of its parent. Replacing either the methyl or the ethyl group of methylpentynol by unsaturated groups like allyl produces higher hypnotic potency, but unduly increases toxicity. The related halogenated compounds, of which ethyl-β-chlorovinylethinylcarbinol (ethchlorvynol) is the only clinical example, have a more intense and more prolonged action than the methylpentynol series. The effect of an ethinyl group upon the feeble potency of carbamate esters is seen in 1-ethinylcyclohexyl carbamate (ethinamate), which is a moderately potent drug, exceptional in that its degradation is not principally in the liver, so that it may safely be given to patients with liver dysfunction.

Other carbamate esters are represented by ethyl carbamate (urethane), a feeble and toxic compound, 2-pentyl carbonate (Hedonal) and tertiary amyl carbamate (Aponal), both dangerously toxic. Some halogenated esters have been investigated, notably the carbamates of trichloroethanol and 1,3-dichloropropanol, which are more toxic than urethane and therefore not clinically feasible. N-substitution in the urethane series develops local anaesthetic properties, but as hypnotics the compounds are not promising. However, propanediol derivatives supply some useful hypnotics, in particular 2-methyl-2-propyl-1,3-propanediol dicarbamate (meprobamate), one of the so-called tranquillisers. This drug is mildly hypnotic and also anticonvulsant. Its relationship to 3-O-toloxy-1,2-propanediol (mephenesin) and mephenesin carbamate is reflected in the muscle relaxant

properties which may broaden its range of clinical indications. 2,2-Diethyl-1,3-propanediol is known to exert a short-lived anticonvulsant action with minimal hypnosis, but the corresponding butanediol is definitely a stimulant drug. There is evidently a limiting molecular weight among the diol series above which sedatives no longer appear.

From the imide of 1,3-propanedicarboxylic acid can be prepared a further series of hypnotics and sedatives. Aryl or alkyl substitution on the beta-methylene group produces stimulants and convulsants like the β-methyl-β-ethyl compound (bemegride), which can be used to counteract drug depression of the central nervous system. Alpha substitution, on the other hand, results in useful hypnotics with some anticonvulsant properties. α-Methyl-α-phenylglutarimide and its N-methyl derivative are anticonvulsants some five times as potent as troxidone, and sedative in heavy doses. The corresponding α-ethyl-α-phenyl drug (glutethimide) is accepted as a general purpose safe hypnotic comparable with phenobarbitone in spectrum.

If the glutarimides be viewed in the light of 2,6-piperidinediones their relationship to another series based on 2,4-piperidinedione appears. Alkyl substitution in these drugs yields sedatives like 3,3-diethyl-2,4-piperidinedione (dihyprylon) which is used in practice as a cough suppressant. But its 5-methyl derivative is methyprylon, a safe hypnotic suitable for nocturnal or daytime sedation.

Benzhydrol plays some part in the structure of a number of newly synthesised tranquillisers which have a rather selective action upon higher brain centres. Its significance, however, in these molecules is far from clear. Diphenhydramine, which is primarily an antihistaminic drug, is the benzhydryl ether of β-dimethylaminoethanol, and can be employed to bring about deep sedation, as a substitute for barbiturates. Para-substituents on one of the phenyl rings do not counteract this activity, for 4-bromodiphen-hydramine is also hypnotic. A 4-chloro derivative, 1-(p-chlorobenzhydryl)-4-(2-(2-hydroxyethoxy)ethyl)-piperazine (hydroxyzine) is used as a tranquilliser. P-butylthiobenzhydryl-2-dimethylaminoethylsulphide (captodiame) is also a low-toxicity tranquilliser with muscle-relaxant properties.

Alpha-4-piperidyl-benzhydrol (azacyclonol) has aroused interest as a potent inhibitor of diethyl-lysergamide (LSD 25) and the hallucinations associated with it, but the 2-piperidyl isomer is a stimulant of considerable potency. One related compound, diethylaminoethyl benzilate (benactyzine) is used as a tranquilliser, and is very potent; it possesses in addition anticholinergic (atropine-like) activity which makes it effective where muscle spasm complicates mental tension.

Joint SAC Meeting in Aberdeen Hears Papers by NCB Workers

TWO papers by members of the divisional laboratory, Edinburgh, of the Scottish Division, National Coal Board, were given at a joint meeting held on 16 May by the Scottish section and physical methods group, Society of Analytical Chemistry, with the University of Aberdeen Chemical Society. Held in King's College, Old Aberdeen, the meeting was presided over by Mr. R. A. C. Isbell, chairman of the physical methods group.

The papers were 'The analysis of clays using ion-exchange resins', by Mrs. Jean MacAuslin; and 'The application of Gamma radiation to the non-destructive examination of coal', by J. Craig Higgins.

Before the meeting a number of instruments were demonstrated in the chemistry department of King's College; these were a cathode-ray polarograph, a Unicam SP900 flame photometer and a high-sensitivity pH meter. Visits were also made to the Macaulay Institute for Soil Research, Craigiebuckler, and the Ministry of Agriculture, Fisheries and Food experimental factory, Aberdeen.

Mrs. J. MacAuslin described the analysis of clays in which the sample was first decomposed and the silica volatilised by treatment with hydrofluoric acid. The cationic components of the clay were then separated from each other and estimated. By the conversion of iron and manganese to anionic chloride complexes and aluminium to an anionic phosphate complex and absorption on anion-exchange resin columns, these metals were separated from the other metallic constituents.

A cationic exchange resin was used to separate sodium and potassium from calcium and magnesium. Sodium and potassium were then determined by flame photometer while titanium was estimated colorimetrically. The alkaline earths were determined by EDTA titration.

Titanium had required special investigation, but by the method adopted its interference in the determination of the other metals had been eliminated.

Mr. Craig Higgins stated that much preliminary proving and survey work was necessary in planning the development of new coalfields, and this was, of course, largely done by test borings obtained in 'core' form.

Gamma radiation from a Harwell radioactive source, attenuated by coal, had been found to serve as the basis of a non-destructive method of examination of the physical structure of coal seams found in the cores. The method is complementary to the visual assessment of seam structure and is carried out before further physical and chemical tests are made.

Work done up to the present has amply demonstrated the practicability of the method and bands of coal with closely similar ash content and specific gravity can be differentiated. Sharp distinction of adjacent coal and dirt bands had been found possible and variations in content of mineral matter had been discovered in parts of the core which had not been revealed by the standard preliminary examination.

Liquid Carbon Dioxide at Chapel Cross

LAST week the first of five thermally insulated bulk storage tanks was delivered to the new atomic power station at Chapel Cross. Designed by the chemical division of the Distillers Co. Ltd., the complete installation there for the storage and evaporation of liquid carbon dioxide will include the five tanks, each holding 20 tons and with a pressure-operated refrigerator and safety valves, combined with six evaporators together capable of vaporising 18 tons of the liquid per hour. Equipment of a similar type was provided by Distillers for Calder Hall.

Suppliers of the plant were: John Thompson Ltd., Wolverhampton (storage tanks); Dick's Asbestos and Insulating Co. Ltd., Silvertown (insulation); Newman Hender Ltd., Woodchester, nr. Stroud (stop valves); engineering development section of the Distillers Co., Epsom (safety valves and evaporators).

BP's New Analytical Lab. at Sunbury

THE analytical and physics laboratory at British Petroleum Co. Ltd.'s Sunbury Research Station has been completed and occupied.

The new building, which is of three floors, will house about 300 technical staff. The laboratory, which has 131 rooms, uses some 12 different types of service such as air, vacuum and high pressure gas.

The finishing of the analytical and physics laboratory marks the near-completion of BP's present building programme which, in addition to this building, has included the erection of an exploration/production research laboratory, new main stores, plant room and a canteen. Total cost of this expansion was approximately £1½ million.

Stainless Steel Plant Production Increased

Extensive additions to the Sheffield works of Shepcote Lane Rolling Mills Ltd. have been completed at a cost of more than £1½ million, making this plant the largest of its kind in Europe and increasing its production by more than 50 per cent.

The hot mill is now capable of handling slabs of up to 8,000 lb. in weight and of rolling stainless steel strip, up to 41½ in. wide, in lengths of 350 to 400 ft. in gauges as low as 0.10 in.

New Smith Kline and French Works at Welwyn Garden City

Smith Kline and French Laboratories have taken a nine-acre site at Welwyn Garden City for their new £1 million pharmaceutical premises which will replace those at Camberwell, London. Work has already started and the buildings will include offices, factory, research and development laboratories. The company's Tonbridge factory will continue to manufacture their medical and veterinary products.

Overseas News

NEW ANIC FACTORY WILL OFFER ITALY 100 PER CENT FERTILISER SURPLUS

THE new synthetic-rubber factory built by ANIC (ENI Group) was officially inaugurated recently at Ravenna in Italy. The new factory is already at the production stage but not all the plants are ready yet.

It is expected that the factory will be in full production by the end of 1958 and, by then, will produce synthetic rubber at the rate of 60,000 tons a year and chemical fertilisers at the rate of 750,000 tons a year.

These figures were announced by Mr. Mattei, president of ENI, in his inauguration speech. There seem to be no doubts concerning marketing of the output of synthetic rubber, writes our Italian correspondent. Italian consumption of rubber during the past four years is as follows:

	Total consumption of rubber	Consumption of synthetic rubber
1954	64,000 tons	10,000 tons
1955	70,000 ,,	13,000 ,,
1956	70,000 ,,	15,000 ,,
1957	73,000 ,,	20,000 ,,

It should not be difficult to increase this percentage once synthetic rubber is produced in Italy and, thus, pays no duty. Furthermore, there are potential customers in many neighbouring countries.

As regards nitrogen fertilisers, the situations seems to be more complex. Italian consumption in the last few years (in terms of the nitrogen content) was:

1951–52 ...	161,300 tons
1952–53 ...	181,000 ,,
1953–54 ...	210,000 ,,
1954–55 ...	237,900 ,,
1955–56 ...	253,900 ,,
1956–57 ...	273,900 ,,

Consumption of nitrogen fertilisers has gone up by 70 per cent in only 5 years. Nevertheless in 1960 the new ANIC factory will produce 130,000 additional tons of nitrogen.

This means that soon the producers of nitrogen fertilisers will be offering the home market about 100 per cent more nitrogen than it can absorb at present.

Mr. Mattei is optimistic. As Holland consumes 69 kg. of fertilisers for each hectare of cultivated land, Belgium 51 kg., Germany 30 kg., and Italy only 9–10 kg., he feels that a good deal can still be done in Italy 'if prices are lowered giving farmers a chance of using fertilisers on a more extensive scale'.

The first 44-lb. bales of synthetic rubber produced at the new ANIC plant recently officially inaugurated at Ravenna

US Rubber Production Estimates

The US Natural Rubber Bureau have scaled down estimates of US rubber production. Output of synthetic rubber, according to the Bureau, is put at 1.06 million long tons instead of the 1.11 million estimated last January. The US is expected to consume 500,000 long tons of natural rubber and 880,000 long tons of synthetic, instead of 550,000 and 960,000 tons previously forecast. These new estimates for supply and for demand are about 5 per cent behind those of last year.

Expansion of Pharmaceutical Production in Poland

Sixteen new pharmaceutical preparations will be manufactured this year in Poland it is reported. Among these will be Terramycin and other imported antibiotics, and also a number of substitutes for products previously imported from Germany such as Novalgin, Luminal and Cardiazol.

In April this year Stargard of Pommern, were to produce under the trade name Starfanil a sulphonamide, similar to that previously imported from Farbenfabriken Bayer AG, Germany, under the trade name Unarfanil. At the same plant, a sulphonamide compound preparation similar to Uranil will be produced. At the end of the year, the amino acid, methionine, used in the treatment of liver disorders, is to be produced. The necessary raw material for this will have to be imported, it is stated.

Israeli Potash Production in March

Production of potash at the Dead Sea works in Sodom during March reached the record level of 8,660 tons. The 1958 total is expected to be over 100,000 tons as compared with a little over 80,000 tons in 1957, the Israel Ministry of Development has announced.

Planned capacity of 135,000 tons from the Sodom plant is scheduled to be attained in 1959. Until recently, technical difficulties have hindered production. The Dead Sea Works Co. believe that the most serious difficulties have already been overcome.

New Anthraquinone Plant and Process

American Cyanamid Co. have announced that they are to build an anthraquinone manufacturing plant at their Bound Brook, New Jersey plant, using a new process developed in the company's research laboratories. The plant will replace and expand existing facilities for the manufacture of anthraquinone. It will also provide additional production capacity for making methyl anthraquinone, naphthaquinone and phthalic anhydride.

Japanese Nitrogen Fertiliser Exports

Production and export figures released by the Japanese Ministry of Agriculture and Forestry show that exports of nitrogen fertilisers increased greatly in 1957.

Japanese Production and Export of Nitrogen Fertilisers [in 1,000-ton N.]

Year	Production	Export	Export as percentage
1951	202.2	18.0	8.9
1952	218.4	55.4	25.4
1953	251.7	49.2	19.5
1954	269.2	55.6	20.7
1955	305.1	64.4	21.1
1956(1)	348.5	95.8	27.5
1957(2)	398.8	127.3	32.0

Despite heavy competition, the Japanese fertiliser industry has managed to increase its exports of fertilisers. The industry is not in the favourable position of the US with regard to the prices of sulphate of ammonia (US prices are stated to be noticeably lower). In South-East Asia, and South Korea, US companies have pushed back Japanese exports to these areas. However, Japanese fertiliser trade has increased in China.

Japanese Exports of Ammonia Sulphate (in 1,000 tons)

	1953	1954	1955	1956
Total	499.2	459.8	413.6	475.5
of which				
Formosa	112.6	243.8	277.4	272.2
S. Korea	318.9	147.4	73.0	93.9
Red China	—	42.4	41.3	77.5

Fertiliser Extensions in Belgium

Société Belge de l'Azote et des Produits Chimiques du Marly last year recorded sales of nitrogen fertilisers totalling 315,000 metric tons, about the same quantity as in 1956. Closure of the Suez Canal and a strike in the Belgian metallurgical industry which kept the works idle for three weeks prevented an expansion of production but in view of the increase in world demand the company remains confident of its ability to place increasing tonnages in the export market and has therefore taken steps to extend the output capacity at Marly. The extension will come into production in the next few months and will be partly based on petroleum products, thus mitigating the handicap resulting from rising coal prices in Belgium. A new fertiliser introduced by the company is ammonium sulfo-nitrate.

The engineering department of SBA-PCM is working on a number of domestic and foreign projects. Among the latter are two Koppers styrene plants for the Houilleries du Bassin de Lorraine in France and for ANIC in Italy, a plant for the treatment of pyrethrum at Kivu, in the Belgian Congo, an ammonium nitrate granulation plant for Société Potasse et Engrais Chimiques in France, a nitric acid plant for a fertiliser project in Mexico, and a plant for the concentration and purification of acetylene from methane for Houilleries du Bassin de Lorraine.

Tenders Invited for Indian Fertiliser Unit

Tenders have been invited by the Neyveli Lignite Corporation (Private) Ltd. for the manufacture, supply and erection (where necessary) at site, of plant, machinery and equipment for the production of urea at their Neyveli, India, fertiliser unit. Applications for details of conditions of contract, specifications, etc., should be sent to the deputy general manager (technical) of the company at Neyveli, Neyveli PO South Arcot District, Madras State, and should be accompanied by a fee of Rs.26/52 per set.

Tenderers should quote both on cash terms and on the following basis: a maximum of 10 per cent f.o.b. value before plant goes into production, with the rest of the payment spread over a period of about three years following substantial production there. The corporation would prefer deferred payment terms.

Efforts to Increase Sales of Italian Sea Salt

A new Company, Societa' Industriale Estrazione Sali, has been floated in Sicily with the aim of modernising the production methods at some 50 salt pans existing along the Trapani-Marsala coast. Although these pans could produce more than 200,000 tons of salt a year, the sea-borne exports of salt have been diminishing considerably during the recent years, as can be seen from the table given below:

1948	143,054	metric tons
1949	171,928	,, ,,
1950	97,369	,, ,,
1951	59,261	,, ,,
1952	100,665	,, ,,
1953	58,855	,, ,,
1954	60,079	,, ,,
1955	60,630	,, ,,
1956	74,572	,, ,,
1957	42,433	,, ,,

The cause of this decline is not due to a fall-off in demand, but to excessive costs of production.

South Africa's Uranium Exports

According to a preliminary estimate by the South African Department of Excise and Customs, South African exports of prescribed materials (uranium and thorium) under the Atomic Energy Act in March totalled £4,831,320, making the cumulative total for the year so far £14,399,692. These figures compare with £3,161,789 and £10,619,487 respectively last year.

Dow Cellulose Gums

Three new water soluble cellulose gums, Methocels 60HG, 70HG and 90HG are now available in volume quantities from Dow Chemical International Ltd., Midland, Michigan, US.

Viscosity of 90HG is 15,000 cps. The highest viscosity previously available in the HG materials was 4,000 cps.

New Argentine Research Organisation

The Government of Argentina has established the Consejo Nacional de Investigaciones Cientificas (National Council for Scientific Research) which will have an initial budget of 100 million pesos a year. It will be affiliated to other international scientific organisations and will carry on research work at a national level over a wide field.

Turkey to Make Fertilisers

Fertilisers will be manufactured at the newly constructed plant in Kutahya, Turkey, where machinery and equipment costing over £T.100 million (approx. £12,500,000) is at present being installed by the Badische Anilin und- Soda Fabrik company. The total cost of the new plant will be about £T.210 million (approx. £26,250,000). When in operation early in 1959 it will produce 9,000 metric tons of nitric acid and 1,000 metric tons of ammonium nitrate for the manufacture of explosives and 110,000 metric tons of nitrogenous fertilisers. This quantity is expected to cover a large part of the country's needs for fertilisers and for explosives for use by the Ministry of Defence.

Felt Filter for Steam

Tetrafluoroethylene (fluorocarbon) felt (Armalon-Du Pont) is under trial as a filtering medium for steam. It has been used to line the inner surface of tubes in a filtration unit at Phillips Chemical's polyethylene plant in the US. According to Phillips, the unit filters particles of iron, oxide, dust, etc., from steam at 325° to 410°F. The particles are stated to range between 5 microns and $\frac{1}{8}$ in. The felt is reported to have given good filtration, physical characteristics have not changed after two months' use and the felt has not 'plugged' excessively.

Foreign Investments in Italian Chemicals

Foreign investments in Italy totalled, during the first quarter of 1958, 4,100 million lire (£2,348,000). Out of this total, 57.3 per cent were accounted for by investments in chemical schemes.

Some data is available concerning a few of these schemes. Baker Platinum of Canada (Toronto), for instance, invested a large amount in Societa' Industriale Italiana Engelhard which will produce special chemical substances, particularly catalysts and colloidal solutions of gold and platinum.

Collins Chemical Co. Inc. of New York have obtained an authorisation to invest $200,000 in the planned Collins Chemical Italiana S.p.A., which will be based in Milan, and to distil and rectify essential oils produced in Italy (mint, lemons and oranges).

Natural Rubbers with Amino Groups

The Institut Francais du Caoutchouc has been carrying out studies described as of scientific and economic importance, whereby tertiary amine groups have been incorporated in natural rubber using the Hofman reaction (amination of alkyl-halides).

To incorporate NR_2 groups in the polyisoprene chain, either partially chlorinated rubber can be used or halogen additions can be made at the double bond.

None of the products obtained are elastic, so the process does not lend itself to vulcanisation, but some of the products lend themselves, it is claimed, to ion-exchanges, and tests have shown these to be rather more effective than products of somewhat similar constitution.

Graphite Crucibles Recommended

GRAPHITE crucibles are recommended by research workers at Oregon State College for growing high purity potassium chloride crystals. Crystals of the alkali halides are usually grown in platinum crucibles, but the US report suggests that the crystals produced are not as pure as was thought since alkali halides attack platinum at high temperatures in the presence of air.

Work carried out at Stanford Research Institute on the examination of commercial and laboratory-grown crystals of potassium chloride (grown in platinum crucibles) has shown that the crystals were luminescent, emitting yellow light under ultra-violet exertation.

Intentional contamination of potassium chloride with platinum showed that the ultra-violet absorption was related to platinum content. Stanford research workers conclude that contamination in K.Cl. crystals could be as high as 2 p.p.m. (as $PtCl_6$) and in lower valent forms could possibly be higher.

Using a graphite crucible, with pure starting material and an inert atmosphere (argon), a KCl crystal was grown that was judged to be 'pure' by ultra-violet absorption spectroscopy.

Phosdrin Introduced

The Dutch firm NV De Bataafsche Petroleum Maatschappij (Royal Dutch/Shell group) has put on the market the insecticide 'Phosdrin.'

This new insecticide, successfully used in the US since mid-1957, and introduced in the UK last year by Shell Chemicals Ltd., is mainly used for the control of aphids, red spider mites, and beet fly larvae. It can be used immediately prior to harvesting, as the poison loses its effect after one or two days.

People in the NEWS

● New manager of the General Electric Co.'s research laboratories at Wembley is Mr. J. BELL. He will take charge of the administration of the group of establishments, but the responsibility for scientific policy and the programmes will remain with the present director of research MR. O. W. HUMPHREYS. Mr. Bell has been manager of the telecommunications division of Wembley laboratories since 1953. He will retain the leadership of this work.

● DR. T. F. WEST, D.Sc., Ph.D., F.R.I.C., is European operations executive of the newly opened African Pyrethrum Technical Information Centre at 4 Grafton Street, London W1. During 1936–48, Dr. West, published a series of papers on the chemistry of the pyrethrins and methods of determining the active principles of pyrethrum flowers. Towards the end of 1948 he became director of the developmental division, Drug Houses of Australia Ltd., and was appointed a director of the company in 1951.

● DR. G. STEDMAN has been appointed a lecturer in the department of chemistry at University College of Swansea.

● The following new appointments in the Industrial Group of the UK Atomic Energy Authority have been announced: MR. P. T. FLETCHER, formerly director of engineering, becomes a deputy managing director; MR. H. V. DISNEY, formerly deputy director defence plants, supplies and services, becomes director of engineering; and MR. R. V. MOORE, formerly deputy director, civil reactors, becomes director of reactor design.

● MR. R. D. WATSON, manager of the Lancashire district of British Oxygen Gases Ltd., has been elected chairman of the Manchester and district branch, Institute of Welding for the coming year.

● Three of the 21 scientific secretaries chosen for the 2nd United Nations International Conference on the Peaceful Uses of Atomic Energy come from the UK. All three have been working at Harwell and were seconded by the authorities concerned. TERENCE E. F. CARR since 1953 has carried out biological research for the Medical Research Council; FRED HUDSWELL was principal scientific officer at the UK AERE where he directed research on the preparation of inorganic compounds, and WILLIAM B. WOOLLEN has been working for the Ministry of Supply and Atomic Energy Authority on nuclear physics, chemical engineering and reactors. The conference starts at Geneva on 1 September, but the secretaries have already arrived at UN headquarters there.

● MR. E. P. DANGER has been appointed a director of Kemp's Bureau of Trade Research Ltd. with general responsibility for the operation of the bureau.

● MR. D. PATTERSON has been appointed lecturer in colouring matter in the department of colour chemistry and dyeing at the University of Leeds from 1 October.

● At the annual general meeting on 22 May of the Association of Public Analysts the following were elected officers for the coming year: *president*, H. E. MONK; *vice-president*, J. H. SHERRATT; *past presidents*, T. MCLACHLAN, E. VOELCKER, F. C. BULLOCK; *hon. treasurer*, R. C. SPALDING; *hon. secretary*, D. D. MOIR; *asst. hon. secretary*, F. A. LYNE; *hon. editor*, E. C. WOOD.

● MR. J. E. CLARK has been appointed manager of the Midlands district for British Oxygen Gases Ltd. He succeeds MR. J. G. WILLIAMS, who retired after 46 years' service with the company.

● MR. F. J. PIZZITOLA has been named general manager, chemicals division, of the Olin Mathieson International Corporation, 460 Park Avenue, New York 22, US. After being associated with Monsanto Chemical Co. in South America, Mr. Pizzitola joined Olin Mathieson in 1956 and assisted the vice-president in charge of operations.

Obituary

MR. T. W. AIKEN, sales director of the Bryan Donkin Co. Ltd., Chesterfield, died at the age of 55 on 20 May. Mr. Aiken, who lived at Wilmslow, Ches., joined Bryan Donkin in November 1918. He was a member of the Institution of Gas Engineers and an associate member of the Coke Oven Managers' Association.

Wills

MR. JULIAN LEVETT BAKER, of Dial Cottage, Cookham Road, Maidenhead, Berks, retired chemist, editor of *The Analyst*, 1907–20, and of the *Journal of the Institute of Brewing*, 1920–49, chief chemist at Watney's Brewery, former chairman and secretary of the London section of the Society of Chemical Industry, and examiner on malting and brewing for Birmingham University, who died on 29 January last, aged 84 years, left £14,348 4s 5d net value.

BDH Add Cellulose Caprate to Catalogue

CELLULOSE caprate, which can replace Canada balsam as an optical cement, has been added to the catalogue of British Drug Houses Ltd., Poole, Dorset. Canada balsam, it is stated, does not withstand the extreme temperature variations encountered in air service. Cellulose caprate, when compounded with a primary and secondary plasticiser, tolerates these conditions well.

Where the refractive index is not of prime importance it can be used without plasticiser.

Other substances added to the BDH catalogue include cetyl pyridinium bromide, 2-hydroxyl-1-(2-hydroxy-4-sulpho-1-naphthylazo-)-3-naphthoic acid, 1-iodo-naphthalene, 4-methyl-quinoline ethiodide, bis-pyrazolone, diallyl-dithio-carbamido-hydrazine, and 2:3-dihydro-pyran.

US Research Worker Visits WRA

RESEARCH co-ordinator of the division of sanitary engineering services, US Public Health Service, Mr. Harry A. Faber, visited the Water Research Association at Redhill on 19 May. He discussed with the WRA staff the problems at present being investigated at Redhill: detection of leaks in water mains; application of plastics to water distribution; and the coagulation process of water purification.

Mr. Faber felt that details of the work of the WRA technology division on leak detection and in the use of plastics would excite investigation in those fields in the US.

The chemical coagulation process was a matter of great concern in the US and the visit provided an opportunity to discuss progress made in the understanding of the fundamentals of the process.

During his visit, he pointed out that no organisation corresponding to the UK research associations exists in the US, nor is there a Government body corresponding to the DSIR.

Harry A. Faber, left, with Dr. R. F. Packham of the WRA research division

TRADE NOTES

ARMOUR Chemical Industries Ltd., 4 Chiswell Street, London EC1, have taken over business of the chemical division and the Armour Laboratories, previously part of Armour and Co. Ltd. The directors of Armour Chemical Industries Ltd. are: Mr. T. D. Lively, Mr. J. L. McCowan, Mr. M. K. Schwitzer, M.I.Chem.E., and Mr. W. F. Ticehurst, all of whom have been with Armour and Co. Ltd.: Mr. Lively as managing director and Mr. McCowan as director and secretary. Mr. Ticehurst, who has been manager of the Armour Laboratories, will continue in charge of the pharmaceutical side of the business, while Mr. Schwitzer, formerly manager of the chemical division, will be in charge of all industrial chemicals sold by Armour Chemical Industries.

German Branch Office

George Kent Ltd., Luton, are establishing a branch office at Krefeld in the Ruhr. The new office will have a spare-parts department covering the Kent range of products, and its address is George Kent, Ltd., Zweigniederlassung für Deutschland Westparkstrasse 54, Krefeld.

Change of Address

From 9 June, Padley and Venables Ltd., of Livery Street, Birmingham 3, will move to new premises at Suprex Works, Middlemore Lane West, Aldridge, Nr. Walsall (Tel. Aldridge 52831).

From 2 June, the Scotland and Northern Ireland area sales office of High Duty Alloys Ltd., will be at Atholl Avenue, Hillington, Glasgow SW2. (Tel. Halfway 5274).

Mullard Appoint Distributors

Research and Control Instruments have been appointed sole distributors in the UK for electronic measuring instruments and electro-chemical apparatus made by Mullard Equipment Ltd. The range includes: oscilloscopes, valve voltmeters, pulse generators, power supply units, filters, transistor testers, conductivity bridges and cells and potentiometric titration apparatus.

Enquiries for delivery in the UK should be directed to Research and Control Instruments Ltd., Instrument House, 207 Kings Cross Road, London WC1. (Telephone Terminus 8444).

Prices of Recorders Reduced

Increased production has enabled Walker, Crosweller and Co. Ltd., Cheltenham, to make substantial reductions (up to 17 per cent) in the price of all their remote reading instruments, in particular their holder height recorders and indicators.

New MSE Equipment

A complete range of MSE laboratory equipment will be displayed at the Spenser Street London SW1 showrooms of Measuring and Scientific Equipment Ltd. during the first week of July. The display will include several new centrifuges being shown for the first time in the UK after display at the ACHEMA exhibition, Frankfurt. New models include: continuous action basket head centrifuge of 3,000 ml. cake capacity; angle head centrifuge for containers of 250 ml.; moderate priced high speed centrifuge; heavy-duty large capacity general purpose model of new design; and the MSE-Mullard ultrasonic disintegrator, of interest to bacteriologists and biochemists.

Export Licensing Amendments

Licences will no longer be needed for the export of petroleum coke, glue stock, mineral jelly and its mixtures, rosin, certain waxes, abrasives, bismuth and bismuth alloys, vulcanised fibre, lignum vitae, selenium, naphthenic acid and certain botanical drugs. The Board of Trade order concerned is Export of Goods (Control) (Amendment) Order, 1958 (S.I. 1958 No. 844), copies of which can be obtained from HMSO of Kingsway, London WC2, or branches, at 3d each (by post 5d).

Fuel Oil Additives

Amber Chemical Co. Ltd., 11a Albemarle Street, London W1, have developed two chemical additives for improving combustion of marine and diesel fuel oils. The first, Amber SSR 511, is claimed to reduce to a harmless level the formation of sludge during normal storage periods.

The second, Amber SSR 513, is designed for the treatment of diesel fuels. It softens and breaks up the binders in carbon and lowers its ignition point, thus preventing the formation of hard deposits.

Foam Mixing Equipment

The Baxenden Chemical Co. Ltd., of Paragon Works, Baxenden, Accrington, have been appointed sole distributors in the UK and Europe for urethane foam mixing equipment manufactured by the Newton Tool and Manufacturing Co., Wenonah, NJ, US. Actual sales in the UK will be carried out for Baxenden by their parent company, Brown and Forth Ltd., Clifton House, 83–117 Euston Road, London NW1.

DIARY DATES

THURSDAY 5 JUNE

Chemical Society—London: Large Chemistry Lecture Theatre, Imperial College, SW7. 7.30 p.m. Faraday lecture; 'The history of the isoprene rule' by Professor L. Ruzicka.

Polarographic Society—London: Duke of York, Dering Street, W1. 7 p.m. 'Problems associated with the study of effluent treatment in the gas industry' by M. Jackman.

Royal Society—London: Burlington House, Piccadilly, W1. 4.30 p.m. 'The structure of chromium potassium alum' by G. E. Bacon and W. E. Gardner and 'Moiré patterns on electron micrographs, and their application to the study of dislocation in metals' by G. A. Bassett, J. W. Menter and D. W. Pashley.

Market Reports

Holiday Affects Manchester Market

LONDON Conditions have remained quiet in most sections of the industrial chemicals market with the volume of new business only moderate. Contract deliveries to home consumers have been called for steadily, but there has not been much interest in new forward business. Prices throughout the market are unchanged and steady. There has been a satisfactory flow of export enquiry and bookings have been maintained at a good level. The demand for agricultural chemicals and also the coal-tar products has been reasonably good for the period.

MANCHESTER Holiday conditions this week left their mark on the movement of chemicals and allied products in the Lancashire and Yorkshire areas and only a moderate number of enquiries were dealt with on the Manchester market. Extended stoppages at a number of cotton mills have further adversely affected the demand for chemicals from this branch, and contract deliveries to other industrial outlets have also been on a reduced scale, though a return to more or less normal trading conditions is anticipated next week. The call for most fertilisers is now seasonally quiet, with moderate activity reported in the market for the tar products.

GLASGOW Although there is still room for improvement, trading during the past week in the Scottish heavy chemical market showed a tendency in that direction. However, a slight falling off occurred, particularly in regard to the textile industry, against which demands for the heavy industries were maintained. On the whole, prices have remained more or less unchanged. Continued activity is reported in regard to both exports and agricultural chemicals.

First Dounreay Reactor in Operation

OVER the Whitsun weekend, the materials-testing reactor at Dounreay, Caithness, was put into operation. To start the reaction, a rod containing enriched uranium fuel was placed in position by the director of Dounreay Research Establishment, Dr. Robert Hurst.

The first of three atomic reactors at Dounreay, this plant will, when fully working, produce neutrons with an intensity of 10^{14} per square centimetre. Eventually, it should run at a power of 10,000 kW. Designed to help future research on atomic power, DMTR (Dounreay Materials-Testing Reactor) is the first large-scale reactor of its kind in Scotland.

SCI Microbiology Group Visit Pfizer Factory

Members of the microbiology group of the Society of Chemical Industry visited the Sandwich, Kent, factory of Pfizer Ltd. on 8 and 15 May. Mr. B. Hollis, assistant secretary of the group, led the first party and Dr. D. H. F. Clayson, chairman, led the second party.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £136.

Alum, Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18

Ammonia, Anhydrous. Per lb., 1s 9d,-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 7d to 5s 0½d; golden, 2s 10½d to 4s 3½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP. gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bag, £1 less.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder, £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bag, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2½d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 2s 9d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £66.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1,260 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 1s 2d. per lb.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 1d; for 1-cwt. lots, per lb., 13s 2d.

Iodoform. Under 1 cwt., per lb., £1 2s 4d, for 1-cwt. lots, per lb., £1 1s 8d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £104 5s: orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £116; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £106 5s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s 6d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb. 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2½d.

Potassium Iodide. BP, under 1-cwt., per lb., 8s. 6d.; per lb. for 1-cwt. lots, 8s 3d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11½d; 3-cwt. lots, per lb., 1s 10½d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 4d.. 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack., £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 13s ; 1-cwt. lots, per lb., 12s 9d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1 ton lots, 1 cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., £29 10s.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, cwt. lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, up to £18 10s

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 10s.-£12 2s 6d; 140° Tw., arsenic free, £8 15s.; 140°Tw., arsenious, £8 9s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14; 1 cwt., £14 5s.

Titanium Oxide. Standard grade comm., rutile structure, £178 ; standard grade comm., anatase structure, £163.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £88 10s; green seal, £86 10s; red seal, £83 10s.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128 in 10-gal. drums, £118; in 40-45-gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £152.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-4-5 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125

***tert*-Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons; £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £222; 45-gal. drums, d/d, per lb., 2s 0½d.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, per lb., 1s 9d.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per lb., 1s 8d.
Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 4s 2¾d. D/d in 40/45-gal. drums, p.p.g. extra, 1d.
Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66 o.p. : 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, per gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal drums, £183; in 10-gal. drums, £173; in 40/45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203 ; in 10-gal. drums, £193 ; 40-45 gal. drums, less than 1 ton, £168 ; 1-9 tons, £165 ; 10 tons and over, £163 ; in 400 gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. Per lb., according to packing, 8d-1s.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 5¾d to 1s 8d; dark, d/d, per lb., 1s 1½d-1s 5d.
Lithopone. 30%, about £56 10s.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL-TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ¼d. Crude, 60's, per gal., 8s 4d.
MANCHESTER: Crystals, d/d, per lb., 1s4d-1s 7d; crude, naked, at works, 8s 4d.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s 3d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s.-17s 6d.
Toluole. Pure, per gal., 5s 6d; 90's, d/d, 2,000 gal. in bulk, per gal., 5s.
MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 2d-6s 6d.

INTERMEDIATES AND DYES

(Prices Nominal)

***m*-Cresol 98/100%.** 10 cwt. lots d/d, per lb., 4s 9d.
***o*-Cresol 30/31°C.** D/d, per lb., 1s.
***p*-Cresol 34/35°C.** 10 cwt. lots d/d, per lb., 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.
***p*-Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.
Nitronaphthalene. Per lb., 2s 5½d.
***o*-Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.
***p*-Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Chemical Stocks and Shares

Bank Rate Cut and the Investment Outlook

THE Bank Rate reduction from 6 per cent to 5½ per cent has been expected for so long that its immediate impact has been extremely limited and after last week's settlement of the railway wage dispute markets had mainly discounted a ½ per cent Bank Rate reduction.

But, nevertheless, prices were very firm and most industrial equities advanced.

As usual, no sooner has a reduction in the rate been announced than markets are looking for the next change.

It seems clear that the Government was reluctant to cut the rate during the last few weeks for fear that our labour disputes would have a bad effect on the strength of sterling.

It is now safe to assume that there will be a further reduction of a ½ per cent in the next few weeks, provided that adverse news about our labour situation does not affect the generally improving strength of the pound and provided that there is no reduction in production resulting from a strike.

Also, of course, one must keep a keen eye on the US recession position. It is possible that British Industry has still to feel the full effect of what has already happened and that profits have still some considerable way to fall. But as I forecasted some six months ago US business should take a turn for the better at least by the end of the summer. Consequently prices of gilt edge securities and industrial equities should advance gradually to the higher levels ruling some two years ago, and with the equity investor too interested in the future to take much notice of poor current results, markets will regain some of their healthy conditions.

It will also be found that the recent strength in industrial equities as a whole has taken into account a good deal of adverse news.

Over the last two weeks chemical shares have attracted a good deal of investment support. Investment buying of Fisons on press comment continued the old 43s 9dxd and the new 17s 7½d. British Glues were 1s 4½d up to 13s 6d. O. and M. Kleeman were firmer at 3s 1½d following the chairman's encouraging statement with the full accounts. British Xylonite met with renewed support and advanced 1s further to 37s 6dxd. Hickson and Welch rose 1s further to 36s, on good investment demand, while Greeff Chemicals gained 4½d to 16s 7½d in response to the higher distribution and profits. Elsewhere a little support developed for Boots Pure Drug on consideration of the results and proposed scrip issue and the shares rose to 21s 9d. Gas Purification gained 9d to 9s. Reichhold improved 3d to 11s 3d following the full accounts and W. J. Bush 'A' put on 1s 6d to 39s; the results are due next month.

1958 High	Low	Security	27 May	*Change over last two weeks*
20/10½	16/9	Albright & W. 5/-	20/10½	+7½d
10/9	10/3	Anchor Ch. 5/-	10/6	+3d
1/4½	1/-	Ashe Chem. 1/-	1/3	+1½d
20/7½	16/9	Bakelite 10/-	19/6	+6d
6/4½	4/9	Berk F.W. 5/-	5/6	-1½d
20/4½	14/10½	Borax Dfd. 5/-	17/-	-9d
10/3	8/9	Bt. Chrome 5/-	9/3	-1½d
13/6	10/4½	Bt. Glues 4/-	13/6	+1/4½
5/10½	5/-	Bl Plastics 2/-	5/7½	—
8/6	7/7½	Bt. Tar 2/6	8/6	—
38/-	28/3	Bt. Xylonite	37/6xd	+2/6
4/4½	3/6	Coalite & Ch. 2/-	4/4½	+1½d
8/7½	7/6	Hardman & H. 5/-	8/6	+4½d
36/3	31/-	Hickson & W. 10/-	36/-	+1/3
45/-	36/4½	ICI	44/-	+1½d
3/4½	2/7½	Kleeman 1/-	3/1½	—
17/3	14/-	Laporte Ind. 5/-	17/3	+3d
16/6	13/9	Lawes Ch. 10/-	16/-	-6d
16/1½	12/6	Monsanto 5/-	15/7½	-1½d
13/-	10/10½	Reichhold 5/-	11/3	+3d
9/-	8/6	Yorkshire Dye 5/-	9/-	—

Lord Clitheroe in his first half yearly statement and account to shareholders of Borax (Holdings) Ltd., has reported a successful six months' trading to 31 March 1958 by announcing that the Group Trading profits after depreciation of £748,219 (£489,131) amounted to £578,957. He also states that difficulties at the new plant at Boron, California, have righted themselves and, although some technical problems remain he is confident the worst is over. Borax remained steady around 17s yesterday after having moved between 15s 6d and 17s 6d over the last week.

Commercial News

Borax (Holdings) Profits Fall But Increased Earnings Expected

NET profit of Borax (Holdings) Ltd. for the six months ended 31 March 1958 was £384,479, compared with £1,302,537 for the corresponding six months last year. Trading profits were £578,957 (£1,987,178), and profit before taxation was £596,579 (£1,959,983).

After deducting minority interests in a subsidiary, the amount attributable to Borax (Holdings) Ltd. was £242,528 (£903,978).

In a letter to shareholders, Lord Clitheroe, Borax chairman, refers to the new plant at Boron, California, US. 'The start-up of entirely new operations of such magnitude as these is never easy or smooth. Much of the process is new and on a scale so much larger than anything of the kind attempted before anywhere in the world. . . . The difficulties have turned out to be more protracted than we hoped, with the result that we have had to keep much of the old plant staffed and operating, though on a reduced scale, at the same time as the new plant has been getting under way.'

This, he said, had increased production costs very considerably and for the three months ended 31 December 1957 the American operating subsidiary made a loss. However, during the second quarter this three month's deficiency was more than wiped out. 'Some technical problems still remain, but I am confident we are over the worst.'

Although a very marked increase in production from the new Boron plant was achieved in March, the company reports that output failed to reach demand by 'a significant margin'.

Subject to the world's trade maintaining a satisfactory level, in due course the increased earnings expected from the considerable capital outlay made in recent years should be realised. However, says the company, this will not be achieved this year.

Discussing chemical research, Lord Clitheroe said that boron chemistry, which involved organic and inorganic chemistry and a border-line field between the two, was still in its infancy.

'We can confidently expect that its healthy growth will lead to a variety of new and significant products. In the development of boron chemistry the company is playing an ever increasing part and I hope from time to time to be able to tell you more about it.'

Simon-Carves

Sulphuric acid division of the chemical plant department of Simon-Carves Ltd. again concentrated on exports in 1957 as there was still no sign of any major expansion of acid production in Britain. This was stated by Mr. R. B. Potter, chairman, in his annual report. Simon-Carves again secured orders in New Zealand, Australia, South Africa, India and Mexico and have a number of active enquiries from those and other countries. The company has been handicapped by exchange problems in India and by the difficult situation in the Near East.

The coke oven department accomplished further work on the large pilot plant for washing sulphur out of flue gases at the North Wilford power station. The department is now also interested in a process for complete gasification of low-grade coal.

The subsidiary, Chemical Engineering Wiltons, completed several tar distillation plants in the UK and Europe and work proceeded on others for South Africa.

Among overseas companies, Simon-Carves (Africa) (Pty.) Ltd. is actively engaged on a number of sulphuric acid plants.

Although slightly less than in December 1956, present contracts in hand should ensure 'reasonable prosperity for the next few years, notwithstanding that trading conditions are much more difficult than a year ago'.

Mr. Potter said that the consolidated net profit of £1,409,000, before tax, was some £34,000 higher and was a record. Group profits, after tax, were £672,581 (£687,243). The dividend for 1957 totals 25 per cent (20 per cent).

Ashe Chemical

Group net trading profit, including investment income, for 1957 of Ashe Chemical was £97,122 (£75,402), less depreciation, etc., £19,623 (£17,054) and tax of £41,049 (£45,557). Net profit was £36,450 (£12,791). Final dividend of 8½ per cent (7 per cent), making 13½ per cent (10 per cent) is declared. Chairman Mr. F. T. Wright states that more difficult trading conditions have obtained in the first few months of the current year.

Turner and Newall

An interim dividend of 5 per cent on the doubled ordinary stock (5 per cent) is declared by Turner and Newall, manufacturers of asbestos and magnesia, etc. It is stated that trading results were less satisfactory in the first half of the current year; margins and earnings have both been lower.

Head Wrightson

Group trading profit of Head Wrightson and Co. on completed work in the year ended 31 January 1958 was £1,735,422 (£1,446,163). Depreciation accounted for £199,433 (£169,045) and tax £835,574 (£675,226). Group net profit increased from £622,650 to £722,574. Dividend is being increased by the equivalent of 2½ per cent, with a 12½ per cent final payment.

Cape Asbestos

Net profit, before tax, of the Cape Asbestos group for 1957 was the highest-ever at £1,421,021 (£1,154,595). Parent company's net profit was £801,774. Group net profit after tax was £716,572 (£564,933). Final dividend of 12½ per cent is proposed, making a total of 17½ per cent (15 per cent).

Boots Pure Drug

The CIC has consented to the proposed capitalisation of £2,560,000 and the issue of 10,240,000 fully paid ordinary shares of 5s each in the proportion of one-for-four. Annual meeting is to be held on 16 July.

Metal Products Co.

Dividend is being reduced by Metal Products Co. (Willenhall) for the year ended 31 March, 1958, from 22½ per cent to 15 per cent with a final of 7½ per cent.

Trading profits, etc., have declined from £100,535 to £89,130. After tax of £41,500 (£47,627) and crediting over-provided tax £1,249 (£17,137), net profit of £29,191 compares with £48,284.

British Thermostat

Distribution by British Thermostat Co. Ltd., is being raised by 5 per cent to 30 per cent for the year ended 31 January 1958. The final dividend is repeated at 17½ per cent, and a bonus of 5 per cent is being paid in addition.

Group net profit is £387,433 against the previous balance of £296,909 which included adjustments (partly estimated) amounting to £49,613 unrelated to the year's trading. The 1957–58 net profit has been obtained after £81,072 (£83,797) for depreciation, including £2,880 (£16,174) written-off experimental work on new machinery, and after tax of £407,845 (£326,215).

NEW COMPANIES

POLYBOND LTD. Cap. £100. Manufacturers, wholesalers and retailers, importers and exporters of and dealers in chemicals. gases, drugs, medicines, etc. Subscribers: H. Barron, G. L. Barron. Reg. office: 139 Tottenham Court Road, London W1.

PLASTICON INDUSTRIES (1958) LTD Manufacturers of and dealers in plastic substances of all kinds and articles and substances embodying plastic substances. chemical and general merchants, etc. Directors: H. Hodson, W. F. Bates, E. W Bradford. Reg. office: 73 Basinghall Street, London EC2.

BERNARD LABORATORIES LTD. Objects: To carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Registered Office: 239 East India Dock Road, London E14.

SMYTH AND COMPANY (CHEMICALS) LTD. Private company. Capital £5,000 in £1 shares. Objects: To carry on the business of manufacturers, distillers, refiners, importers and exporters of, agents for and dealers in all kinds of chemicals, etc. Registered Office: 20 Ann Street, Belfast.

G. T. CHEMICALS LTD. Cap. £100. Manufacturers of and dealers in chemicals of all kinds, etc. First director: L. G. Leanse. Solicitors: Michael Seltser, 82-90 Seymour Place, London W1.

NEW PATENTS

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Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 18 June

Detergent bars. Hedley & Co., Ltd., T. **796 627**

Producing chlorine dioxide. Columbia-Southern Chemical Corp. **796 778** **796 779**

Polymerisation process. Esso Research & Engineering Co. **796 845**

Cyclic dienones and a process for the manufacture thereof. Hoffmann-la Roche & Co. AG. **796 725**

Production of alloys in mercury. Siemens & Halske AG. **796 805**

Production of very finely particled solids having low bulk density. Badische Anilin- & Soda-Fabrik AG. [Addition to 733 549.] **796 647**

Monoazo dyestuffs of the benzene pyrazolone series and metal complexes thereof. Farbenfabriken Bayer AG. **796 918**

Thermoplastic compositions of water-soluble cellulose ethers. Abbey, A. (Dow Chemical Co.). **796 919**

Coating metal articles. Dow Chemical Co. **796 628**

Interesterification processes. Unilever, Ltd. **796 808**

Metal-containing dyestuffs of the benzene-monoazo-4'-hydroxynaphtho-(2', 1':4, 5)-oxathiol-5-dioxide series. Farbenfabriken Bayer AG. **796 759**

Insecticidal composition. Ruhrchemie AG. [Divided out of 794 661.] **796 675**

Molybdenum lubricants and their manufacture. Institut Francais du Petrole, des Carburants et Lubrifiants. [Divided out of 789 383.] **796 630**

Preparation of indole carboxylic acids. Henkel & Cie, Ges. **796 665**

Apparatus for the production of nodular aluminium sulphate. Sulphates, Ltd. [Divided out of 796 856.] **796 857**

Manufacture of derivatives of 5-pregnene-3, 17-α-diol-20-ones. Schering Corp. [Divided out of 796 767.] **796 768**

Manufacture of 4-pregnene-17-α, 21-diol-20-ones. Schering Corp. [Divided out of 796 767.] **796 769**

Open to public inspection 25 June

Treatment of metal catalysts. Hiskey, C. F. **796 921**

Methods of growing quartz crystals. General Electric Co., Ltd., Brown, C. S., and Kell, R. C. **797 203**

Synthesis of phenanthridines. Boots Pure Drug Co., Ltd. **796 951**

Fungicidal and bactericidal preparations. Farbwerke Hoechst AG. **797 073**

Benzoic acid alkamine esters and a process for their manufacture. Farbwerke Hoechst AG. **797 042**

Matrix for ion exchange resins. Asahi Chemical Industry Co., Ltd. **797 191**

Carboxylic acid type cation exchange resins. Asahi Chemical Industry Co., Ltd. **797 192**

Impregnating a foraminous material. Stark, N. H. **797 075**

Method and apparatus for use in evaporator and/or distillation system. British Petroleum Co., Ltd., and Nathan, W. S. **797 045**

Complex chromium compounds of benzene-monoazo-pyrazolone dyestuffs. Ciba Ltd. **797 046**

Electrodeposition of tetrafluoroethylene polymers and copolymers. Du Pont de Nemours & Co., E. I. **797 001**

Taps for fluids. Coal Industry (Patents), Ltd. **796 925**

Manufacture of terephthalic acid. Imperial Chemical Industries, Ltd. **797 213**

Production of cyclohexanone oxime and O-alkyl ethers thereof. Du Pont de Nemours & Co., E. I. **797 217**

Rubber antioxidants. Monsanto Chemicals, Ltd. **797 138**

Liquid-dispensing apparatus. Steele, L. **797 220**

Electrolytic production of metal alkyls. Esso Research & Engineering Co. **797 093**

Reductive alkylation. Universal Oil Products Co. **797 224**

Barbituric acid derivatives and process for their production. Aktiebolaget Pharmacia. **797 017**

Fluid treatment devices such as devices for de-ionising water. British Filters, Ltd. **797 103**

Heat-stable organic cadmium salts and their use in synthetic resins. National Lead Co. **797 054**

Means for the controlled delivery or dosage of liquids or liquid-solid mixtures. British Filters, Ltd. **797 018**

Pyrazole compounds. Ilford, Ltd. **797 144**

Flexible elastomeric cellular material. Goodyear Tire & Rubber Co. **797 227**

Re-processing flexible cellular materials. Goodyear Tire & Rubber Co. **797 228**

Apparatus for frequency spectrum analysis. Technical Ceramics, Ltd. **797 057**

Settling filters for liquid purification. Boehler, M., and Weber, F. [trading as Boehler & Weber Komm.-Ges.]. **796 965**

Revival of poisoned metallic catalysts. Maxted, E. B. **797 111**

Ammonium nitrate detonating explosives. Imperial Chemical Industries, Ltd. **797 112**

Recovery of titanium tetrachloride. Fabriques de Produits Chimiques de Thann et de Mulhouse. **796 967**

Organotin compounds and compositions containing same. Metal & Thermit Corp. [Addition to 719 733.] **797 113**

Producing metal-cyclopentadiene derivatives. Union Carbide Corp. **797 151**

Producing highly hydrated fibres and structures manufactured therefrom. Zellstoffverfahrens AG. **796 932**

o, o'-Dihyrdroxy monoazo dyestuffs of the benezene-azo-indandione series and metal complex compounds thereof. Farbenfabriken Bayer AG. **797 231**

Manufacture of titanium. Imperial Chemical Industries, Ltd. **797 155**

8-substituted indoles. Upjohn Co. [Addition to 781 390.] **797 258**

Detergent compositions. Hedley & Co., Ltd., T. **797 119**

Manufacture of monovinyl acetylene. Du Pont de Nemours & Co., E. I. **797 120**

Amino resins. Ferguson & Sons, Ltd., J., and Petty, D. C. **797 124**

Separation of water-soluble solutes. Dow Chemical Co. **797 163**

Preparation of polyvinyl alcohols. Lonza Electric & Chemical Works, Ltd. **797 127**

Method of further polymerising liquid organo-polysiloxanes. Kali-Chemie AG. **797 235**

Esters of meta-amino-alkoxybenzoic acids. Zyma Soc. Anon. **797 236**

Production of cellulose acetate threads, fibres, films and analogous articles by extrusion into an aqueous coagulating bath. Soc. Rhodiaceta. **797 128**

Synthetic lubricant. Esso Research & Engineering Co. **797 166**

Manufacture of unsaturated aldehydes. Hoffmann-La Roche & Co., AG., F. **797 200**

Supply and discharge of a gaseous treating medium in a rotating drum and apparatus for the performance of said method. Aktiebolaget Svenska Flaktfabriken. **796 979**

Producing a concentrated titanium free-alloy or hardener free from iron, from raw materials containing titanium. Vereinigte Aluminium-Werke AG. **797 262**

Ferrite material for use at microwave frequencies. Philips Electrical Industries, Ltd. **797 164**

Azaphenthiazine derivatives. Soc. des Usines Chimiques Rhone-Poulenc. **797 061**

Filtration apparatus. Eimco Corp. **796 942**

Organo-siloxane polishes. Midland Silicones, Ltd. **797 263**

Phenthiazine derivatives. Soc. des Usines Chimiques Rhone-Poulenc. **797 172**

Treatment of cellulosic fibres. National Lead Co. **797 173**

Antifungal antibiotic designated ayfactin. Bristol Laboratories, Inc. **796 982**

Composition for reducing period of anesthesia. Sterling Drug, Inc. **797 237**

Processes and compositions for dyeing hair and similar fibres. Soc. Monsavon-L'Oreal. **797 174**

Imidazole derivatives. Monsanto Canada, Ltd. **796 996**

1-(β-hydroxyethyl)-2-substituted amino-2-imidazolines. Monsanto Canada, Ltd. **796 997**

Addition products of polyamines. Onyx Oil & Chemical Co. **797 175**

Production of vitamin B_{12}. Richter Gedeon Vegyeszeti Gyar R.T. **797 176**

Sight glass for observing liquid in a pipe. Yorkshire Tar Distillers, Ltd. **797 238**

Phenthiazine derivatives. Soc. des Usines Chimiques Rhone-Poulenc. **797 179**

Production of vat dyestuffs of the benzanthronimide green series. Farbenfabriken Bayer AG. [Addition to 773 116.] **797 240**

N;N'-bis[(1-aminocycloalkyl)methyl] alkylene diamines. Du Pont de Nemours & Co., E. I. **797 241**

Preparation of esters secondary alcohols and ketones. Esso Research & Engineering Co. [Addition to 776 073.] **797 242**

Triazine-aldehyde compounds and fuel oil compositions containing same. Armour & Co. **797 182**

Bis(1-aminocycloalkylmethyl)amines. Du Pont de Nemours & Co., E. I. **797 244**

Lubricant compositions. Esso Standard Soc. Anon. Francaise. **797 266**

Cycloheptene-(1)-carboxylic acid-(1), its alkali metal salts and its esters. Badische Anilin- & Soda-Fabrik AG. **797 184**

Inhibition of phosphoric acid corrosion of nickel-molybdenum alloys. California Research Corp. **797 267**

Preparation of resinous products. Chemische Werke Albert. **797 268**

Utilisation of inorganic acids in the preparation of fluid lubricants. Esso Research & Engineering Co. **797 247**

Bismuth salts. Chemische Werke Albert. **797 186**

Transesterification catalysts. United States Rubber Co. **797 270**

Enol-ethers and a process for the manufacture thereof. Hoffmann-La Roche & Co., AG., F. [Divided out of 797 200.] **797 201**